STATE OF CALIFORNIA
The Resources Agency

Department of Water Resources

BULLETIN No. 69-67

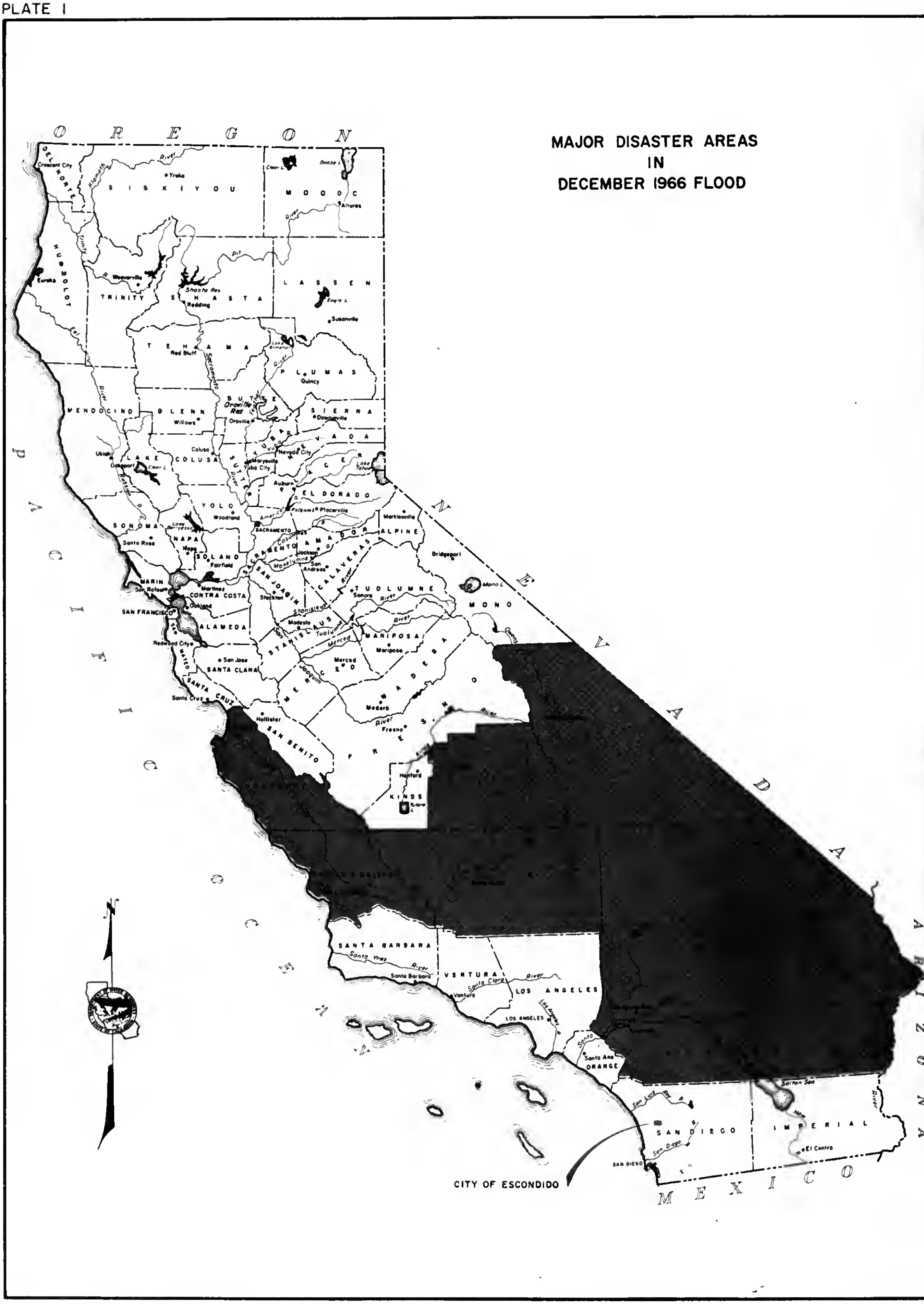
CALIFORNIA HIGH WATER
1966-1967

JUNE 1968

RONALD REAGAN
Governor
State of California

WILLIAM R. GIANELLI
Director
Department of Water Resources

PLATE I



COVER PHOTO: Tule River flooding rich agricultural land in the San Joaquin Valley.
(Courtesy Hammood's Studio, Porterville, California)

FOREWORD

Bulletin No. 69-67, the fifth of an annual series, describes, in one report, the general weather patterns preceding and during storm periods of the 1966-1967 water year, precipitation characteristics, the resulting runoff; and presents information on flooded areas and damages. In addition, tabulations of precipitation comparisons, peak streamflows and stages, reservoir operations, and streamflow hydrographs are also included.

Data for this Bulletin were supplied by the U. S. Weather Bureau, U. S. Geological Survey, U. S. Army Corps of Engineers, U. S. Bureau of Reclamation, and many other agencies, both public and private. Their cooperation is greatly acknowledged.

William R. Gianelli
William R. Gianelli, Director
Department of Water Resources
The Resources Agency
State of California
May 8, 1968

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

RONALD REAGAN, Governor
WILLIAM R. GIANELLI, Director, Department of Water Resources
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ABSTRACT

The 1966-67 water year began with a very dry October, a continuation of a persistent dry regime. Above normal precipitation occurred in November, but the powder-dry soil absorbed all runoff. During the first week of December, an intense storm deposited heavy precipitation over the entire State, and struck with added fury in Kern and Tulare Counties. The Kaweah, Kern and Tule Rivers went on a rampage, causing record peak flows and serious flooding. Widespread damage also occurred in January as a series of storms again swept the State. / Damages resulting from the high levels of runoff and resultant flooding in both December and January were severe. Seven counties, Kern, Tulare, Monterey, San Luis Obispo, Riverside, San Bernardino and Inyo, and the City of Escondido in San Diego County, were proclaimed by the Governor as disaster areas. Two deaths in Tulare County, one in Kern County, and one in Monterey County were attributed to the December flood. Flood damage estimates prepared by the State Disaster Office for the declared disaster areas amounted to over $28 million. Three reservoirs, Terminous on the Kaweah River, Success on the Tule River, and Isabella on the Kern River, were credited with preventing an additional $50 million in flood damage. / Although Santa Barbara County was not declared a disaster area, an estimated $1.1 million of damages resulted from the storms. In the North Coastal area, sharp rises occurred in all streams during both storm periods, but flooding was relatively minor and confined to the Eel River and Russian River lowlands. / A series of storms beginning in March and continuing into April produced record May 1 snow depths and water content in the Central and Southern Sierra watersheds. Below average May temperatures delayed the beginning of the snowmelt period, posing a hazard because of both the magnitude of water in snow storage and the increasing possibility of a continued warm period. During the peak snowmelt runoff period, there was concern that uncontrollable flooding would develop. Close cooperation by the Department of Water Resources, U. S. Bureau of Reclamation, U. S. Corps of Engineers, and local Reclamation and Irrigation Districts, and below average temperatures during the most critical period prevented a major snowmelt flood. / Snowmelt flood damage estimates prepared by the U. S. Corps of Engineers amount to five million dollars. / With the advance of the first intense December storm, flood control preparations were set into full swing by the Department of Water Resources, a condition that continued into July because of the unusual late snowmelt runoff.

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TABLES

TABLES (Continued)

PLATES

Table 1: Precipitation Comparison For Six Storms: North Coastal And Sacramento Valley Basins**

Station	One Day						Two Days						Three Days						Four Days					
	Dec. 1955	Feb. 1960	Oct. 1962	Jan-Feb 1963	Dec. 1964	Jan. 1967	Dec. 1955	Feb. 1960	Oct. 1962	Jan-Feb 1963	Dec. 1964	Jan. 1967	Dec. 1955	Feb. 1960	Oct. 1962	Jan-Feb 1963	Dec. 1964	Jan. 1967	Dec. 1955	Feb. 1960	Oct. 1962	Jan-Feb 1963	Dec. 1964	Jan. 1967
North Coast																								
Alderpoint	5.06	3.66	3.83	3.70	5.85	2.27	6.96	6.46	6.30	6.40	10.35	4.20	7.76	8.85	8.45	7.68	13.60	4.48	9.51	9.65	10.95	8.16	14.70	5.20
Cummings	7.00	6.00	4.03	5.08	11.20	4.06	11.00	10.42	7.64	7.65	18.04	6.74	12.20	12.84	11.01	9.83	22.70	7.61	15.90	14.00	13.28	10.59	25.44	8.57
Gasquet RS	7.29	3.65	3.82	2.47	6.35	3.81	10.19	6.52	6.32	4.43	10.39	5.77	11.39	9.01	8.20	5.10	13.90	6.56	14.02	10.16	9.29	7.06	17.16	7.78
Mad River RS	4.04	3.80	3.94	4.63	7.87	2.08	7.55	7.25	6.67	6.93	14.77	3.65	9.77	10.25	8.23	--	--	4.67	12.44	11.45	10.96	--	(5 days 21.07	5.54
Orleans	3.50	2.70	3.23	1.92	7.38	2.34	6.55	5.38	4.29	3.52	11.07	4.55	7.54	7.92	6.15	5.09	13.63	5.50	9.46	8.52	7.83	5.50	14.50	6.44
Scotia	5.39	2.05	1.93	1.86	5.13	1.62	7.19	4.09	3.76	2.99	7.35	2.66	8.62	5.47	5.01	4.46	9.10	2.94	11.53	6.25	6.49	4.99	9.68	3.76
Cloverdale 3 SSE	6.25	3.30	8.37	3.30	3.97	4.63	9.08	4.30	11.30	6.33	7.82	6.24	9.75	4.80	11.77	9.07	10.19	7.64	14.80	5.21	11.82	9.26	11.27	7.64
Guerneville	7.68	8.40	5.30	3.03	3.70	6.91	9.81	9.44	7.58	5.89	6.45	9.32	10.18	10.16	8.40	8.71	7.57	10.55	14.84	10.62	8.82	8.81	8.68	10.55
Healdsburg	3.73	2.86	4.89	5.08	4.28	4.31	6.65	4.71	8.34	9.97	8.35	8.21	7.66	5.17	9.64	10.75	9.50	8.25	9.98	5.72	10.52	11.19	10.24	8.28
Saint Helena	5.76	4.30	5.58	4.63	4.02	6.83	7.99	6.00	9.08	8.16	7.60	9.68	9.08	7.19	10.64	9.45	9.14	9.90	12.58	7.46	11.29	9.87	9.49	9.90
Sacramento Valley																								
Red Bluff WB AP	0.96	1.28	1.90	1.23	1.08	1.77	1.79	1.47	3.16	2.41	1.89	3.11	2.45	1.59	3.42	3.46	1.95	3.19	2.73	1.81	3.51	3.49	2.41	3.19
Shasta Dam	8.24	3.18	3.54	2.64	11.64	3.32	12.28	4.26	6.22	5.01	15.22	4.94	16.23	5.04	7.59	6.27	18.80	5.09	22.15	5.66	10.27	6.56	21.38	6.24
Paskenta RS	2.42	1.37	2.15	2.65	3.04	1.93	3.48	1.83	3.38	3.80	4.41	2.83	4.43	2.25	3.64	3.85	4.85	2.97	5.93	2.31	4.08	3.85	5.10	2.97
Sacramento WB	2.41	0.86	3.63	1.70	1.79	2.87	3.81	1.25	5.80	3.09	2.92	4.09	4.11	1.45	6.69	3.60	3.38	4.09	5.16	1.45	6.85	3.65	3.72	4.23
Marysville	2.27	0.69	4.24	2.03	0.74	1.72	4.10	0.90	7.29	3.38	1.10	3.12	4.31	0.95	9.26	3.58	1.37	3.58	5.45	1.50	9.31	3.69	1.63	3.59
Brush Creek	8.68	8.55	11.40	4.99	9.41	8.25	11.93	10.29	18.75	9.78	14.56	12.40	13.64	11.03	23.70	12.55	18.76	13.20	18.08	11.88	25.99	12.95	20.78	13.20
Blue Canyon WB AP	7.44	5.50	7.37	8.70	9.33	6.27	13.36	10.41	13.81	13.96	15.24	10.25	18.55	12.06	19.55	16.01	19.79	10.36	20.66	12.55	22.02	17.38	22.93	10.47

Table 2: Precipitation Comparison For Six Storms: San Joaquin, Central Coast And Southern California Basins***

Station	One Day						Two Days						Three Days						Four Days					
	Mar. 1938	Nov. 1946	Jan. 1952	Feb. 1958	Nov. 1965	Dec. 1966	Mar. 1938	Nov. 1946	Jan. 1952	Feb. 1958	Nov. 1965	Dec. 1966	Mar. 1938	Nov. 1946	Jan. 1952	Feb. 1958	Nov. 1965	Dec. 1966	Mar. 1938	Nov. 1946	Jan. 1952	Feb. 1958	Nov. 1965	Dec.* 1966
San Joaquin Basin																								
Fresno WB	2.05	0.64	1.74	1.11	0.57	.99	2.84	.83	1.81	1.54	.86	1.95	3.03	.83	1.81	1.54	1.32	2.47	3.05	1.33	1.81	1.54	1.58	2.47
Yosemite NP	3.23	2.58	1.90	2.45	2.52	4.05	4.54	5.13	3.62	3.25	3.74	7.22	5.74	5.13	3.63	3.55	4.48	7.61	5.95	5.13	3.66	3.67	5.72	8.48
Springville	2.95	4.15	1.27	1.82	0.77	8.46	4.96	4.71	2.39	3.25	1.54	13.29	6.39	4.71	2.49	3.26	2.01	17.39	7.56	7.25	2.91	3.26	2.47	17.41
Central Coast																								
Los Gatos	1.89	3.18	4.82	2.91	1.02	1.49	3.11	3.52	6.66	4.24	1.93	1.94	3.27	3.52	7.23	4.85	2.47	2.31	3.32	4.40	9.19	5.30	3.04	3.11
Salinas FAA	0.85	0	1.30	1.00	1.23	1.58	1.30	0	1.50	1.06	1.41	2.42	1.52	0	1.79	1.18	1.41	2.72	1.65	0	2.20	1.19	2.34	2.89
Paso Robles FAA	1.25	2.45	1.02	1.04	1.85	3.07	2.48	2.51	1.30	1.99	2.42	4.97	3.15	2.51	1.53	1.99	2.89	5.64	3.26	2.96	2.04	1.99	3.30	5.64
South Coastal Basins																								
Santa Maria WB	1.93	1.08	1.20	1.21	1.88	1.04	2.25	1.30	2.21	1.53	2.18	1.79	2.51	1.41	2.23	1.53	2.24	1.81	2.53	1.54	3.07	1.53	2.52	1.81
Cuyamaca	7.65	2.95	2.72	2.48	9.60	6.04	10.14	3.72	5.09	4.03	10.69	11.79	11.08	4.05	5.66	4.41	10.99	14.56	13.54	4.45	5.77	4.41	11.90	17.15
Riverside Fire Station #3	--	1.29	1.68	1.31	1.46	2.08	--	1.79	2.06	1.71	2.76	2.30	--	1.94	2.94	1.91	2.96	3.60	--	1.94	3.06	1.91	3.40	4.40
La Mesa	2.00	1.21	1.60	2.04	2.09	2.72	2.76	1.66	2.67	2.48	3.28	3.02	4.06	1.82	2.87	2.51	3.28	4.02	4.34	1.85	2.88	2.51	3.63	4.32
Los Angeles AP	5.88	2.67	1.61	3.49	2.12	1.49	6.36	3.85	2.56	3.49	2.81	1.78	6.74	4.96	3.69	3.49	3.12	1.99	6.74	5.53	4.89	3.49	3.55	3.38
Santa Barbara	3.59	2.15	5.29	3.10	3.49	2.42	5.82	2.33	6.74	3.80	4.05	2.74	6.58	2.33	6.94	4.23	4.76	3.21	6.58	3.28	8.79	4.41	5.08	3.21
Oxnard	3.30	4.30	3.22	2.98	2.51	1.86	4.96	5.58	4.16	3.04	3.39	1.88	4.96	6.18	6.30	3.04	4.76	1.88	4.96	6.25	7.24	3.04	5.22	2.62
San Diego WB	1.56	0.88	1.29	1.37	1.53	1.34	2.27	1.15	1.78	1.94	2.32	2.07	2.80	1.20	2.29	2.00	2.72	2.47	2.89	1.24	2.29	2.00	2.86	2.99

The underlined value is the maximum value for the six storms listed.

*This storm includes rain on January 1, 1966, at some precipitation stations.

**Dates of Storm Periods Used:

Dec. 15-31, 1955
Feb. 6-10, 1960
Oct. 9-14, 1962
Jan. 29-Feb. 2, 1963
Dec. 18-30, 1964
Jan. 19-31, 1967

***Dates of Storm Periods Used:

Mar. 1-15, 1938
Nov. 8-24, 1946
Jan 12-19, 1952
Feb. 2-5, 19-21, 1958
Nov. 14-26, 1965
Dec. 1-8, 1966

THE WEATHER OF WATER YEAR 1966-67

For California, the winter and spring of 1966-67 was one of anomalies in weather events. The rain season began notably with a wet November, and this pattern extended into the first half of December; then followed a contrasting dry period covering the latter half of December and the first half of January. Another reversal brought a series of storms in the latter half of January, but February was almost rainless. At Sacramento, as an example, there were only two days with rain totaling 0.40 inch. Only twelve Februaries since 1849 had less rainfall at Sacramento. March and April brought a record-breaking cool and wet spring with snow accumulations to great depths in the mountains.

In the following sections will be discussed the important storms of December 1966 and January 1967, which resulted in high water and floods, and the snow accumulation during the Spring of 1967, which resulted in the large-volume snowmelt runoff. Table 1 and Table 2 show precipitation comparison for selected storms.

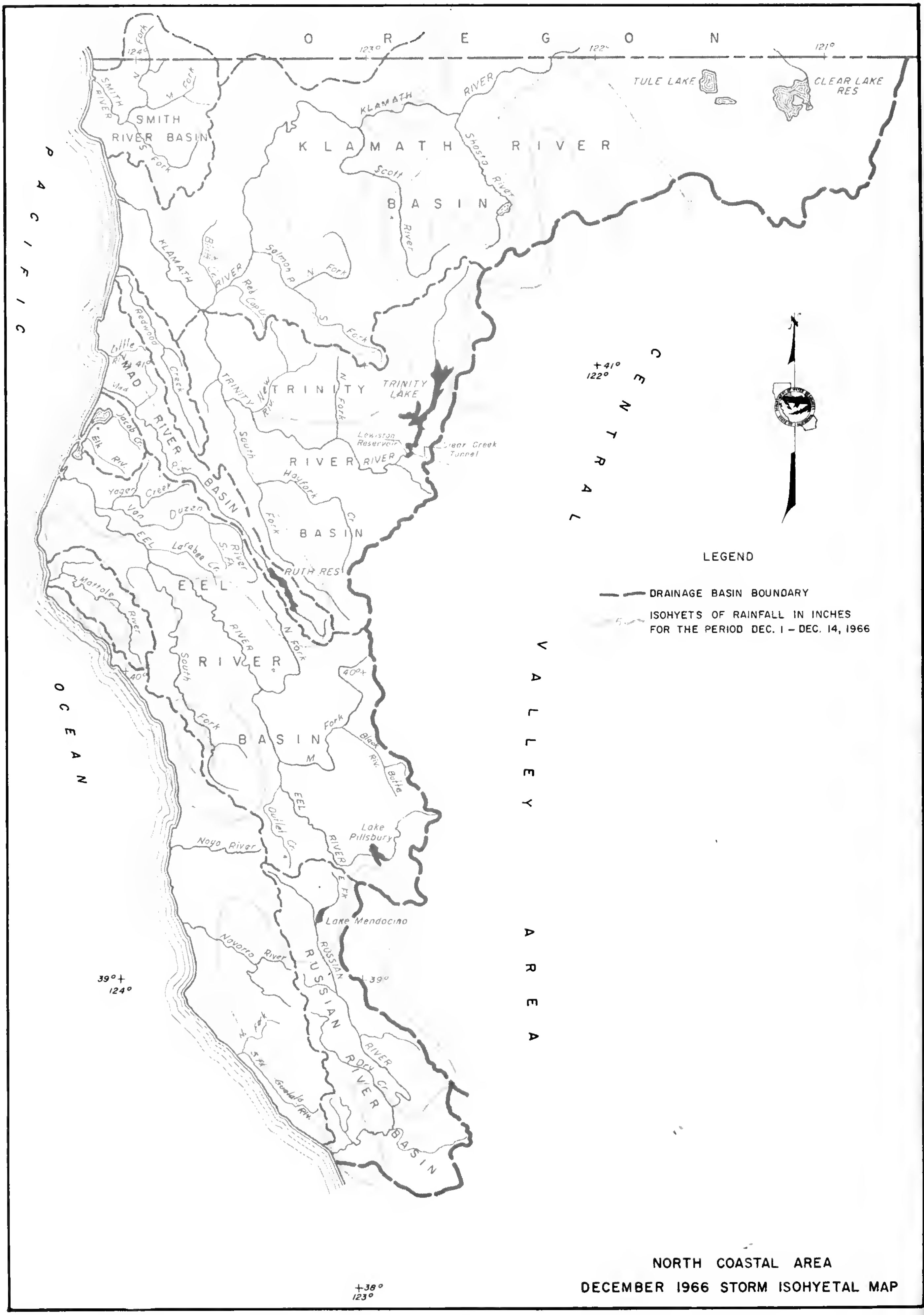
December 1966

As often occurs in California during winter months, December 1966 consisted of two opposite weather patterns: wet during the first half, dry during the second half. The rains in the early part of the month were a continuation of the November storms.

The northwestward movement of a blocking ridge of high pressure from the Bering Sea to Siberia during the first days of the month produced a strengthening of westerlies over the eastern Pacific and the migration of deepening cyclones toward the west coast. The Pacific high-pressure cell near latitude 20°N remained moderately strong, so that the westerly flow over the Pacific coastline between the high-pressure center and the moving cyclones became very strong. After December 8, there was a northward movement of the belt of strongest westerlies, so that the storm track also migrated north.

A cold front moved into the State on December 1. This was associated with a rather deep low-pressure center located about 450 nautical miles west of Astoria, Oregon. A wave, which formed on the trailing end of the front, made landfall in the Bay Area on the 2nd. The southwest flow following the frontal system maintained precipitation on the 3rd, and the arrival of a new frontal system on the 4th brought even heavier precipitation. This front succeeded in pushing southward as far as the southern San Joaquin Valley on December 5, but on the following day the front surged back to the north. It was during the 3-day period from mid-day of the 4th to the afternoon of the 6th that the heaviest rain fell in the Sierra Basins of the San Joaquin Valley, particularly in the Kaweah, Tule and Kern River Basins.

When the front moved into the Southern San Joaquin Valley on the 5th, the cold air mass in the wake of the front had a snow level at 6,000 feet in the Upper San Joaquin and Kings River Basins (and much lower northward from these basins). Some snow fell on the night of the 4th-5th at Grant Grove (elev. 6,600 feet). When the front moved northward on the 6th, the snow level lifted to the 9,000-foot level, and thus the heavy rains on the Kings, Tule,


O R E G O N
PACIFIC OCEAN
SMITH RIVER BASIN
KLAMATH RIVER BASIN
TULE LAKE
CLEAR LAKE RES
TRINITY RIVER BASIN
TRINITY LAKE
Lewiston Reservoir
Clear Creek Tunnel
MAD RIVER BASIN
EEL RIVER BASIN
RUTH RES
Lake Pillsbury
Lake Mendocino
RUSSIAN RIVER BASIN
CENTRAL VALLEY AREA
LEGEND
DRAINAGE BASIN BOUNDARY
ISOHYETS OF RAINFALL IN INCHES FOR THE PERIOD DEC. 1 – DEC. 14, 1966
NORTH COASTAL AREA
DECEMBER 1966 STORM ISOHYETAL MAP

Kaweah and Kern River Basins occurred at high elevations, aggravating the runoff potential.

Another area which received heavy rain was the drainage of the Upper Salinas River. Latitudinally, this area corresponds to the area of the Kaweah-Tule in the Sierra Nevada and lies in the path of the strong WSW flow at the upper levels of the atmosphere adjacent to the weather front. The heaviest rain area in the Salinas Basin was in the vicinity of Santa Margarita.

The rainfall during the December 1966 storm was statewide. In the north, the period extended from the 1st through the 14th. In Southern California, the rain period was limited to the first seven days.

The rainfall in the North Coast area was not especially heavy, and although the rain-period extended for half of the month, there was no significant concentration of rainfall in any short period of time. The same comments could be made about the Sacramento River drainage basin.

The shifting of the belt of strongest westerlies northward during the latter half of December brought the end to storm movements through California. This pattern continued into the first half of January.

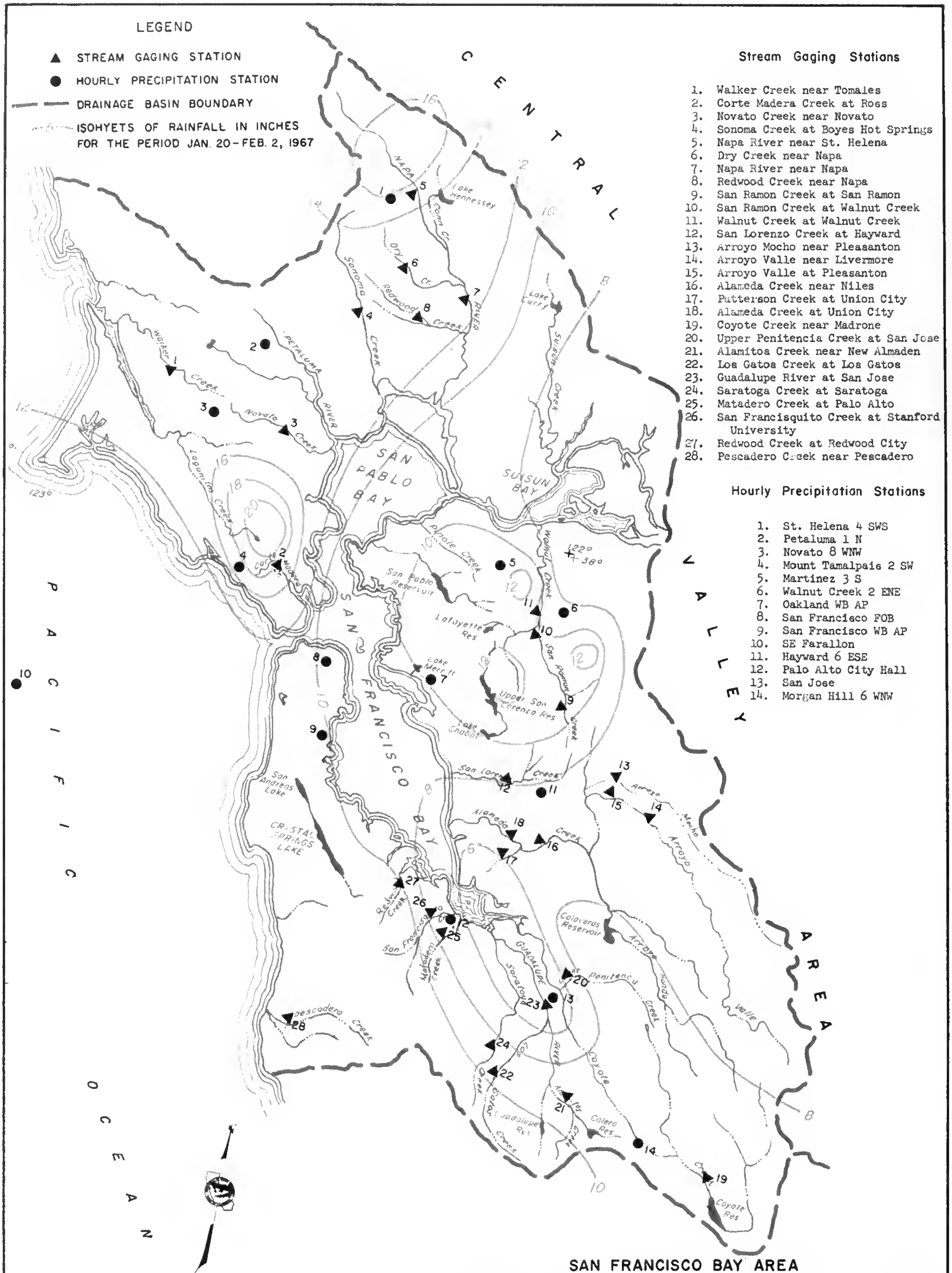
Isohyetal maps of the December storm were prepared for the following areas:

Area	Period	Plate No.
North Coast (including Russian River)	Dec. 1 - Dec. 14	2
Central Coastal	Dec. 1 - Dec. 8	11
Central Valley San Joaquin River - Tulare Lake Drainage	Dec. 1 - Dec. 8	15

January 1967

The weather pattern over the eastern Pacific changed in the middle of the month to a more southerly storm track. On the 17th and 18th, the storm-generating low-pressure center, which had been located off the northern British Columbia Coast in the first part of January, moved southward and created a more southerly track of cyclonic storms from the mid-Pacific Ocean inland. The progressive southward displacement of the storm track affected even Southern California.

The first significant front reached the California North Coast on the 19th. This front stalled in a semistationary position across Mendocino County and produced a number of waves which prolonged the period of moderate precipitation through the 21st. The front finally moved into Southern California on the 22nd. Another migratory low moving across the eastern Pacific reached the California coast late on the 23rd and Southern California on the next day. The third storm and its associated weather front arrived on the 26th. This in turn was followed closely by occluded waves on the 28th and 30th.



SAN FRANCISCO BAY AREA
PRECIPITATION AND STREAM GAGING STATION LOCATION
AND
JANUARY 1967 STORM ISOHYETAL MAP

During the 14-day period from January 19 to February 1 (inclusive), Eureka had 8.03 inches of rain, which is about 120 percent of the January normal precipitation of that station. At San Francisco International Airport, 10.43 inches fell in the 14 days; this is 260 percent of the January normal. While the daily amounts were not outstandingly heavy, the persistent precipitation, with concentrations on the 20-21st and 26-27-28th, was effective in generating significant runoff in the Northern and Central California streams.

The small amplitude waves on the weather front on the 20-21st passed the coastline near the Bay Area and brought a swath of heavier precipitation oriented through the Bay Area and northeastward into the Sacramento Valley. The cold front of the wave on the evening of the 21st was especially vigorous, depositing 0.51 inch in one hour at the San Francisco International Airport and 0.59 inch in one hour at Sacramento (downtown gage). This heavier precipitation of the 20-21st affected especially the Russian River and Cache Creek drainage basins, which experienced significantly higher runoff peaks on the night of the 21-22nd in the January storm series. In other basins, the runoff peak flows were either of the same magnitude or less for the 20-21st than on the 29th or the 31st.

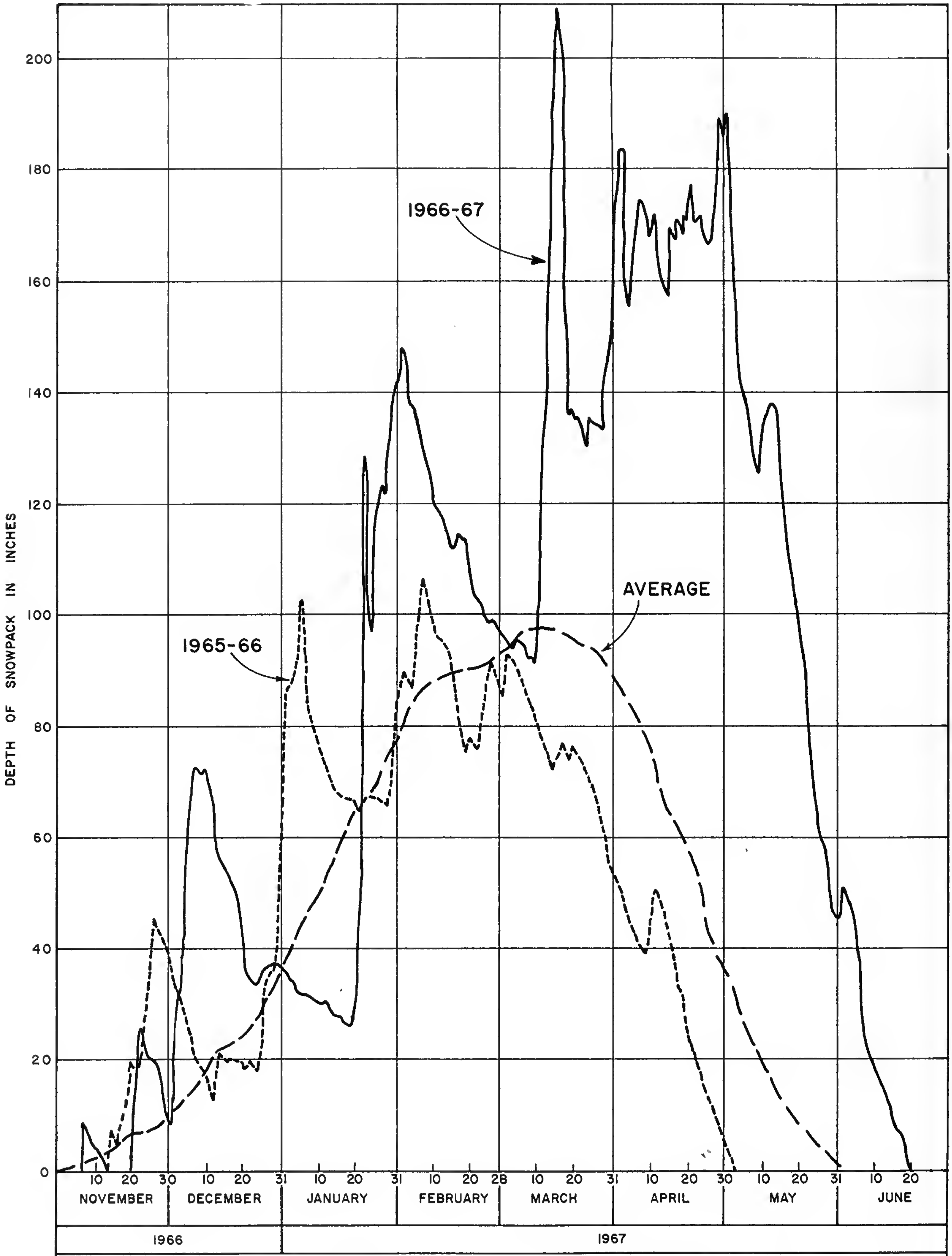
The upper level flow pattern during the last half of January displayed a deep trough over the Pacific Coast states and a strong ridge of high pressure from the Gulf of Mexico to Bermuda. The strong southwest flow emanating from the Pacific trough to the Atlantic Ocean over the eastern ridge was the cause of much above-normal temperatures over the eastern part of the United States. In the west, the southwest flow brought heavy rainfall to California.

The air mass characteristics during the rain-period in California were intermediate--not cold and yet not warm. The snow level in the north was about 3,000 feet and 5,000 feet in the south. At Mt. Shasta City (elev. 3,544 ft.), there was only one inch of snow on the ground on the 19th, but 30 inches by the 25th. At this station, some warming occurred during the period 27-29th. This resulted in some melting and compaction of the snowpack.

Isohyetal maps for the January 1967 storms have been prepared for the following areas:

Area	Period	Plate No.
San Francisco Bay Area	Jan. 20 - Feb. 2	3
North Coast (Including Russian River)	Jan. 19 - Feb. 2	7
Central Valley (Sacramento River Drainage)	Jan. 20 - Feb. 2	12

PLATE 4



DEPTH OF SNOW AT NORDEN

ELEVATION 7000 FEET

Spring and Summer 1967

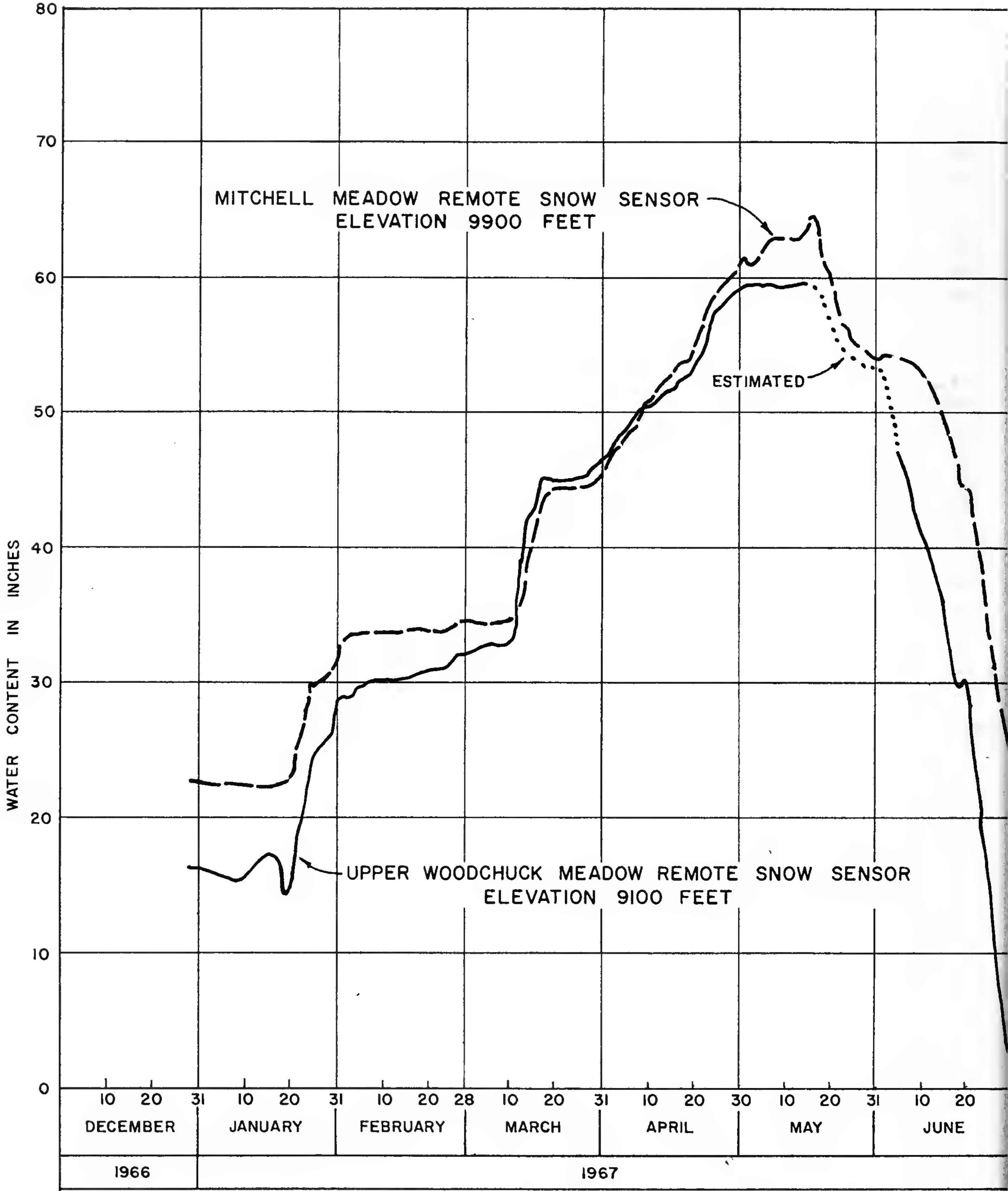
The water supply outlook on February 1 favored an above-average year. The State had recorded rainfall and snowpack accumulation well above normal with the exception of the southeast desert region. However, the unusually dry February offset the snowpack gains of the previous three months and the April-July water supply outlook at the end of February was for just a normal year.

It was, however, a wet March. The weather circulation pattern changed; a trough of low pressure near the California Coast replaced the ridge of high pressure which had dominated the atmosphere circulation in February. The storms, which began around the 10th, were of the cold type depositing vast quantities of snow in the mountains down to about the 2,000-foot level.

As an example of the snow accumulation, the snow depth at Norden in Placer County (elev. 6,900 feet) was 96 inches on March 1, 92 inches on March 10, and reached a maximum depth for the year of 210 inches on March 15. The exception in storm characteristics during the month was the storm of March 16-17, which was warmer, the snow level being near 7,000 feet. This storm unleashed up to five inches of precipitation on the 16th, resulting in an overnight consolidation and a drop in snowpack depth as dramatic as the rise. The warmer temperatures and rainfall also resulted in some snowmelt at the lower elevations. The storms near the end of the month were again colder and brought additional snow down to the 2,000-foot level. By the end of the month, the snowpack on a statewide basis was 130 percent of average for that date. Plate 4 provides a plot of the Norden snow depth, along with the normal snow depth curve and the curve for the 1965-66 season.

In most years, Spring temperatures begin to melt the Sierra snowpack in April. But Spring 1967, continuing the radical departure of weather events from the normal, produced one of the coldest Aprils on record. At Sacramento, for instance, it was the coldest April since temperature records began in 1878. The stormy weather of March had continued into April, bringing precipitation in the form of snow in the mountains and adding to the already substantial Snowpack. April precipitation throughout the State averaged 225 percent of normal, ranging from 170 percent in the Lahontan area to 380 percent in the Central Coastal area. By the end of April, the statewide water content of the snowpack was 225 percent of normal. The year's snow accumulation was comparable to, and in some areas greater than, that experienced in the big snow years of 1938, 1952, and 1958.

In the Southern Sierra, the snow water content was the greatest ever recorded since the beginning of the California Cooperative Snow Survey Program in 1929. Moreover, it is noteworthy that this great snowpack occurred so late in the season. Plots of the water content at two courses in the Kings River Basin are shown on Plate 5. Data from other stations or courses in the Sierras show similar histories of snow deposition and depletion. By the first of May, cooperative snow survey measurements confirmed the magnitude of the snowpack in the Sierras, and April-July forecasts of unimpaired runoff were revised upward from their previous values in April.



WATER CONTENT OF SNOW
KINGS RIVER BASIN

During May, the temperature throughout the Central Valley and the Sierra Nevadas finally warmed to more typical spring values as the storm track was displaced northward and the State came under the influence of high pressure. On the whole, temperatures during the month turned out to be a few degrees above normal. The upward swing of temperatures began on the 10th, and there was a sustained warm period until about the 27th. This period of above-normal temperatures, when valley floor maximum temperatures reached the 90°-100°F range, started the first significant snowmelt runoff into the reservoirs of the Sierra streams. The month closed out with lowering temperatures, and below-normal temperatures persisted until the middle of June. Undoubtedly, the moderation of temperatures after May 27 proved to be a saving feature of the Snowmelt Season 1967, in that decreased runoff from snowmelt allowed reservoir operators time to draw down the reservoirs and create space for the remaining runoff.

The circulation pattern which brought this cool period during the latter part of May and the first half of June was the movement of a quasi-stationary trough of low pressure at the mid-troposphere levels (10,000 to 20,000 feet) of the atmosphere near California and an accompanying cooler air mass over the State. Time plots of the maximum temperatures at key stations are shown along with flow hydrographs on Plates 21, 23, 24, 26, 28 and 31. Mountain temperatures during clear weather periods are related to valley floor temperatures with a lapse rate of between 2 to 4° Fahrenheit per 1,000 feet of elevation. Thus valley floor maximums of 100° Fahrenheit are associated with maximums of about 89° Fahrenheit at the 4,000-foot level and 77° Fahrenheit at the 8,000-foot level.

Thunderstorms and showers occurred on the first four days of June and again on the 11th and 12th. However, these showers did not produce significant runoff, and the cloudy skies kept temperatures on the cool side. The rising temperature trend began about the 13th and the latter half of June had above-normal temperatures. The last three days of the month brought maximum temperatures on the valley floor in the 100's and in the 80's at the 4,000-5,000-foot level in the mountains. On the whole, the months of June and July were within a few degrees of normal at most stations.

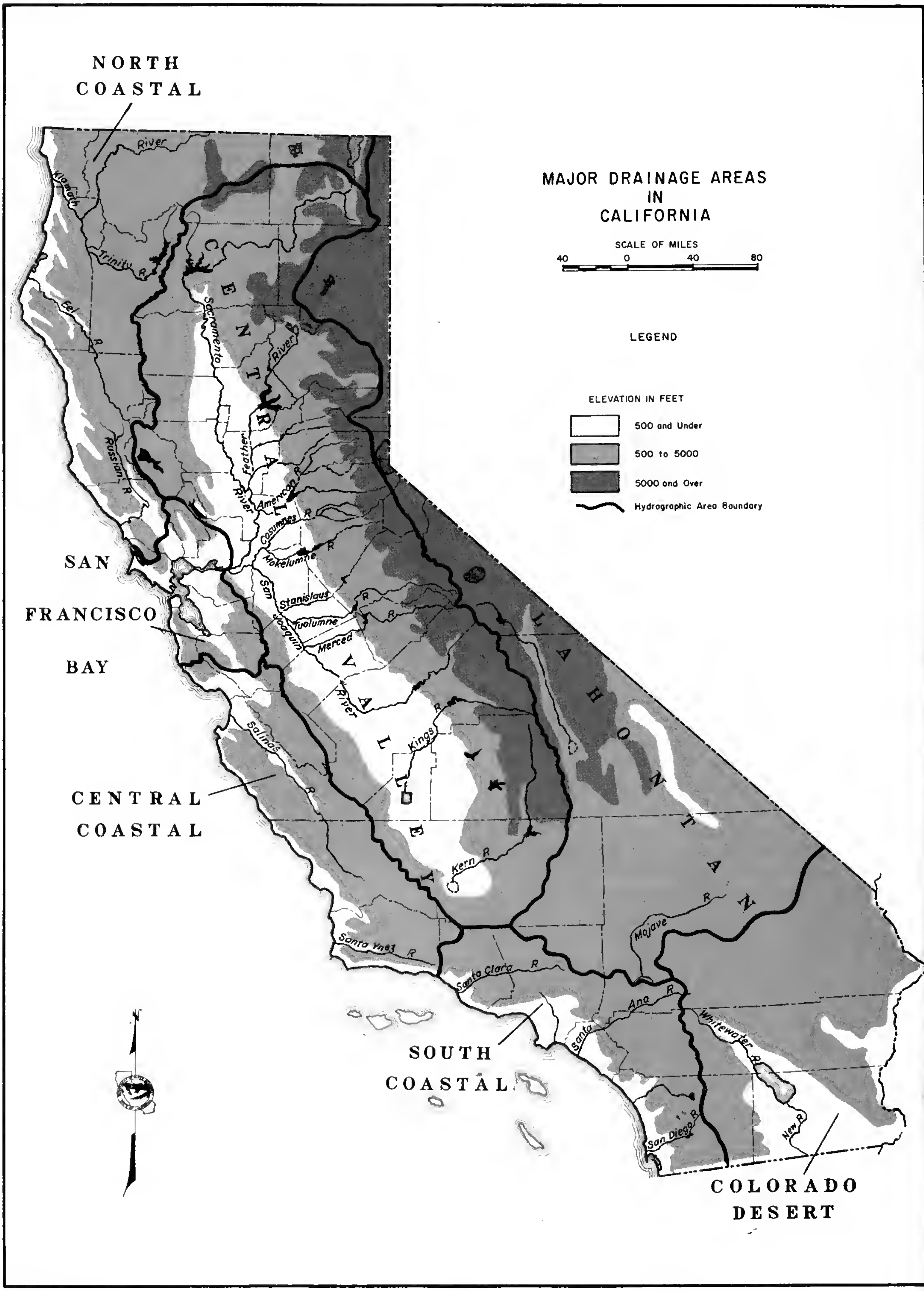
The monthly average temperature at six first-order U. S. Weather Bureau stations and at one cooperative station (Yosemite National Park) are given in Table 3. Also included is the departure of the 1967 temperatures from the 30-year normals (1931-1960) as computed by the U. S. Weather Bureau.

Table 3: Monthly Average Temperatures

Station	April		May		June		July	
	Av. Temp. °F	Dep. °F	Av. Temp. °F	Dep. °F	Av. Temp. °F	Dep. °F	Av. Temp. °F	Dep. °F
Bakersfield	52.7	-10.3	70.5	+ 0.1	75.2	- 1.9	86.7	+ 2.4
Blue Canyon[1]	29.6	-16.0	52.1	- 0.1	58.9	- 0.3	70.5	+ 2.5
Fresno	52.6	- 8.7	68.8	+ 0.6	74.3	- 0.4	83.8	+ 2.5
Red Bluff	49.4	-11.0	66.7	- 1.6	73.7	- 2.5	82.2	+ 2.5
Reno	50.3	- 7.7	54.9	+ 1.0	59.9	- 0.2	69.6	+ 1.9
Sacramento	49.6	- 8.8	67.7	+ 3.5	70.1	+ 0.1	78.7	+ 4.7
Yosemite N.P.[2]	39.6	-12.2	57.4	- 0.1	60.4	- 3.8	71.2	- 0.8

[1]Elevation 5,280 feet [2]Elevation 3,970

Average temperature for one day is the sum of the maximum and minimum temperatures divided by two; for the month the value shown in the table is the average for 30 or 31 days.


NORTH
COASTAL
MAJOR DRAINAGE AREAS
IN
CALIFORNIA
SCALE OF MILES
40 0 40 80
LEGEND
ELEVATION IN FEET
500 and Under
500 to 5000
5000 and Over
Hydrographic Area Boundary
CENTRAL VALLEY
LAHONTAN
SAN
FRANCISCO
BAY
CENTRAL
COASTAL
SOUTH
COASTAL
COLORADO
DESERT
Klamath River
Trinity R
Eel R
Russian R
Sacramento River
Feather River
American R
Cosumnes R
Mokelumne R
San Joaquin River
Stanislaus R
Tuolumne R
Merced R
Kings R
Kern R
Salinas R
Santa Ynez R
Santa Clara R
Santa Ana R
Mojave R
Whitewater R
New R
San Diego R

RAINFALL-RUNOFF

Statewide precipitation during the 1966-67 water year was 130 percent of average. Only the Colorado Desert area was below average, receiving 80 percent of normal. The North Coastal area received 110 percent of average, and the Central Coastal Area a high of 150 percent of average.

Streamflow during the year was well above normal. Total runoff in major California watersheds was about 155 percent of normal. In the Central Valley Area, runoff ranged from 130 percent of normal in the Upper Sacramento River Basin to over 250 percent of normal in southern Sierra drainages. The greatest water year runoff in over 50 years was experienced in the Kaweah River (265 percent of normal), Tule River (295 percent of normal), and Kern River (245 percent of normal). The North Coastal area had a comparatively low 125 percent of normal streamflow for the year. In the Central Coastal and San Francisco Bay areas, water year runoff was 205 percent of normal.

Aggregate carry-over storage in the State's major reservoirs was the greatest of record; exceeding the previous high of October 1, 1965 by over 2,200,000 acre-feet. Water stored in Sacramento Valley reservoirs on October 1 was 8,900,000 acre-feet, (125 percent of the 10-year average). San Joaquin Valley Reservoirs contained 3,745,000 acre-feet, or 170 percent of average October 1 storage. New power generation records were set while controlling near-record volumes of snowmelt runoff. Reservoir operations (peak inflow, releases and storage) are presented in Table 15.

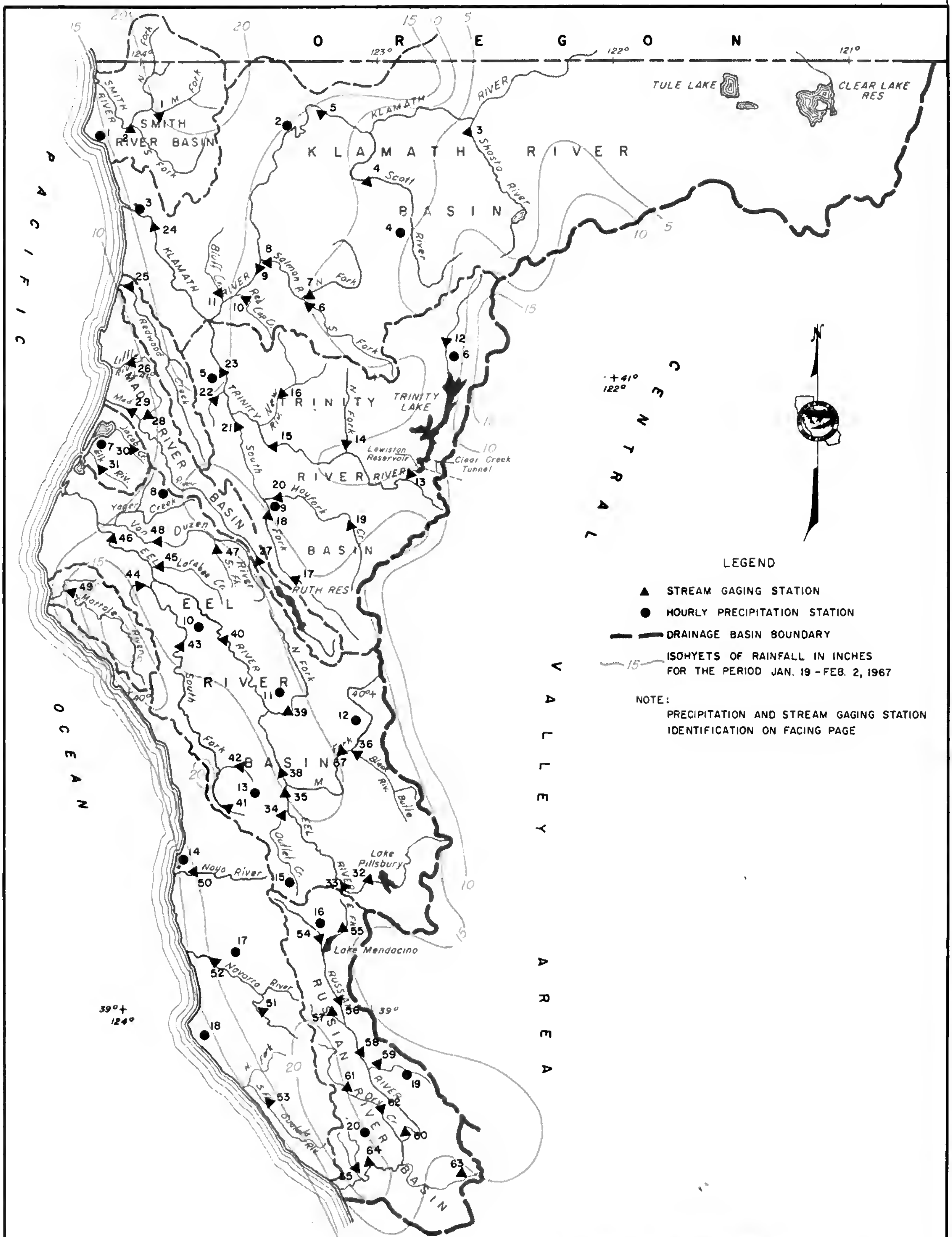
A series of six storms beginning in March and continuing into April assured California of an excellent water year. Record snow depths were reported in the Central and Southern Sierra watersheds. Additional storms and below-average temperatures during May resulted in a delay in the beginning of the snowmelt runoff. The late snowmelt retention posed a spring flood hazard because of both the magnitude of water in snow storage and the increasing possibility of a continued warm period causing a rapid and extended snowmelt.

Close cooperation by the Department of Water Resources, U. S. Bureau of Reclamation, U. S. Army Corps of Engineers, and local Irrigation Districts, in the operation of flood control reservoirs, combined with below-average temperatures during the most critical period, prevented a major snowmelt flood.

With the advance of the first intense December storm, flood control preparations by the Department were set into full swing; this condition continued into July because of the unusual late snowmelt runoff.

North Coastal Hydrographic Area

The light rain, which began falling over the area on November 31, intensified on December 1 and continued through December 14. This storm produced fairly high amounts of accumulated precipitation. The second storm system, beginning January 20 and extending into February, recorded higher precipitation amounts and greater intensities. Sharp rises in all North Coastal streams occurred immediately following both storms.



NORTH COASTAL AREA
PRECIPITATION AND STREAM GAGING STATION LOCATION
AND
JANUARY 1967 STORM ISOHYETAL MAP

Stream Gaging Stations

1. Middle Fork Smith River at Gasquet
2. Smith River near Crescent City
3. Shasta River near Yreka
4. Scott River near Fort Jones
5. Klamath River near Seiad Valley
6. South Fork Salmon River near Forks of Salmon
7. North Fork Salmon River near Forks of Salmon
8. Salmon River at Somesbar
9. Klamath River at Somesbar
10. Red Cap Creek near Orleans
11. Bluff Creek near Weitchpec
12. Trinity River above Coffee Creek near Trinity Center
13. Trinity River of Lewiston
14. North Fork Trinity River at Helena
15. Trinity River near Burnt Ranch
16. New River at Denny
17. South Fork Trinity River at Forest Glenn
18. South Fork Trinity River near Hyampom
19. Hayfork Creek near Hayfork
20. Hayfork Creek near Hyampom
21. South Fork Trinity River near Salyer
22. Willow Creek at Willow Creek
23. Trinity River near Hoopa
24. Klamath River near Klamath
25. Redwood Creek at Orick
26. Little River of Crannell
27. Mad River near Forest Glenn
28. North Fork Mad River near Korbel
29. Mad River near Arcata
30. Jacoby Creek near Freshwater
31. Elk River near Falk
32. Eel River below Scott Dam near Potter Valley
33. Eel River at Van Arsdale Dam, near Potter Valley
34. Outlet Creek near Longvale
35. Eel River above Dos Rios
36. Black Butte River near Covelo
37. Middle Fork Eel River below Black Butte River, near Covelo
38. Eel River below Dos Rios
39. North Fork Eel River near Mina
40. Eel River at Alderpoint
41. South Fork Eel River near Branscomb
42. Tenmile Creek near Laytonville
43. South Fork Eel River near Miranda
44. Bull Creek near Weott
45. Larabee Creek near Holmes
46. Eel River at Scotia
47. South Fork Van Duzen River near Bridgeville
48. Van Duzen River near Bridgeville
49. Mattole River near Petrolia
50. Noyo River near Fort Bragg
51. Rancheria Creek near Boonville
52. Navarro River near Navarro
53. South Fork Gualala River near Annapolis
54. Russian River near Ukiah
55. East Fork Russian River near Calpella
56. Russian River near Hopland
57. Feliz Creek near Hopland
58. Russian River near Cloverdale
59. Big Sulphur Creek near Cloverdale
60. Russian River near Healdsburg
61. Dry Creek near Cloverdale
62. Dry Creek near Geyserville
63. Santa Rosa Creek near Santa Rosa
64. Russian River near Guerneville
65. Austin Creek near Cazadero

Smith River Basin

In the Smith River Basin at Gasquet Ranger Station, 19.09 inches of precipitation was reported during the 14-day January storm. This is two inches more than the total recorded during the disastrous December 1964 flood. However, the majority of precipitation stations in the basin reported totals well below the 1964 storm.

The December 1 to 14 storm deposited 15.77 inches of rain at the Elk Valley precipitation gage, and during the January 20 to February 2 storm, 20.42 inches was recorded. At Fort Dick, 10.09 inches of precipitation fell during the December storm, and 14.79 inches during the January storm.

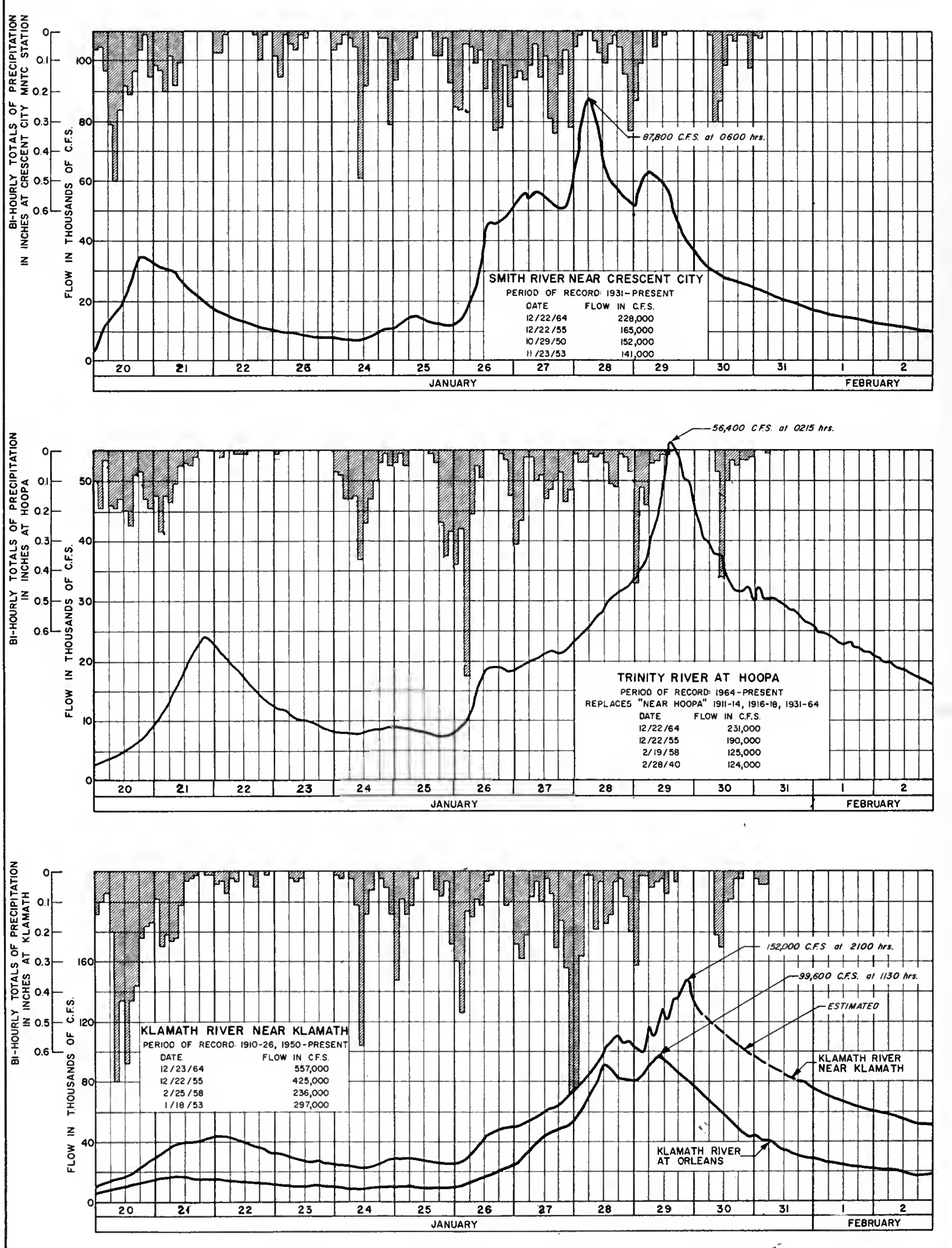
The Smith River near Crescent City reached a peak stage on January 28 of 30.35 feet; well below the 35-foot danger stage.

Plate 8 presents a hydrograph of the Smith River near Crescent City.

Hourly Precipitation Stations

1. Crescent City Maintenance Station
2. Happy Camp Ranger Station
3. Klamath
4. Etna
5. Hoopa
6. Coffee Creek Ranger Station
7. Eureka WB City
8. Kneeland 10 SSE
9. Hyampom
10. Miranda Spengler Ranch
11. Lake Mountain
12. Covelo Eel River Ranger Station
13. Laytonville
14. Fort Bragg
15. Willits Howard Forest Ranger Station
16. Redwood Valley
17. Navarro 1 NW
18. Point Arena
19. The Geysers
20. Venado

PLATE 8



HYDROGRAPHS OF SMITH, TRINITY AND KLAMATH RIVERS

Klamath-Trinity River Basins

The Klamath-Trinity Rivers drain an area of 15,700 square miles, a portion of which extends into Oregon. More than half of the North Coastal Hydrographic Area is made up of the drainage of Klamath River and its main tributaries in California: the Trinity, Salmon, Scott, Shasta and Lost Rivers.

The December storm produced comparatively moderate rises in the basin streams, whereas the January storm propelled the streams to the season's peak flows. On January 29, the Klamath River near Klamath crested at 26.57 feet; the flood stage at this location is 33.0 feet. The Trinity River at Hoopa peaked at 33.4 feet, or 5 feet below flood stage.

The season's peak flows were below flood stage in all the Klamath Basin streams. Plate 8 delineates the flow during the January storm in the Klamath River at the Klamath and Orleans gaging stations, and in the Trinity River at Hoopa.

Mad River Basin

Rainfall totals recorded in the Mad River Basin during the December and January storms were of moderate intensities and duration. In the December storm 10.35 inches of precipitation fell at the Mad River Ranger Station and 6.16 inches at Eureka. In the January storm, 13.08 inches was measured at the Ranger Station and 8.03 inches at Eureka.

Ruth Reservoir, on the Mad River, reached the season's maximum storage of 58,190 acre-feet on January 29. On the same day, the mean daily spill and release reached a peak of 4,580 cfs. Downstream at Arcata, the Mad River peaked during the January storm at 15.8 feet, and reached its season's peak of 18.2 feet during the December storm.

Redwood Creek Basin

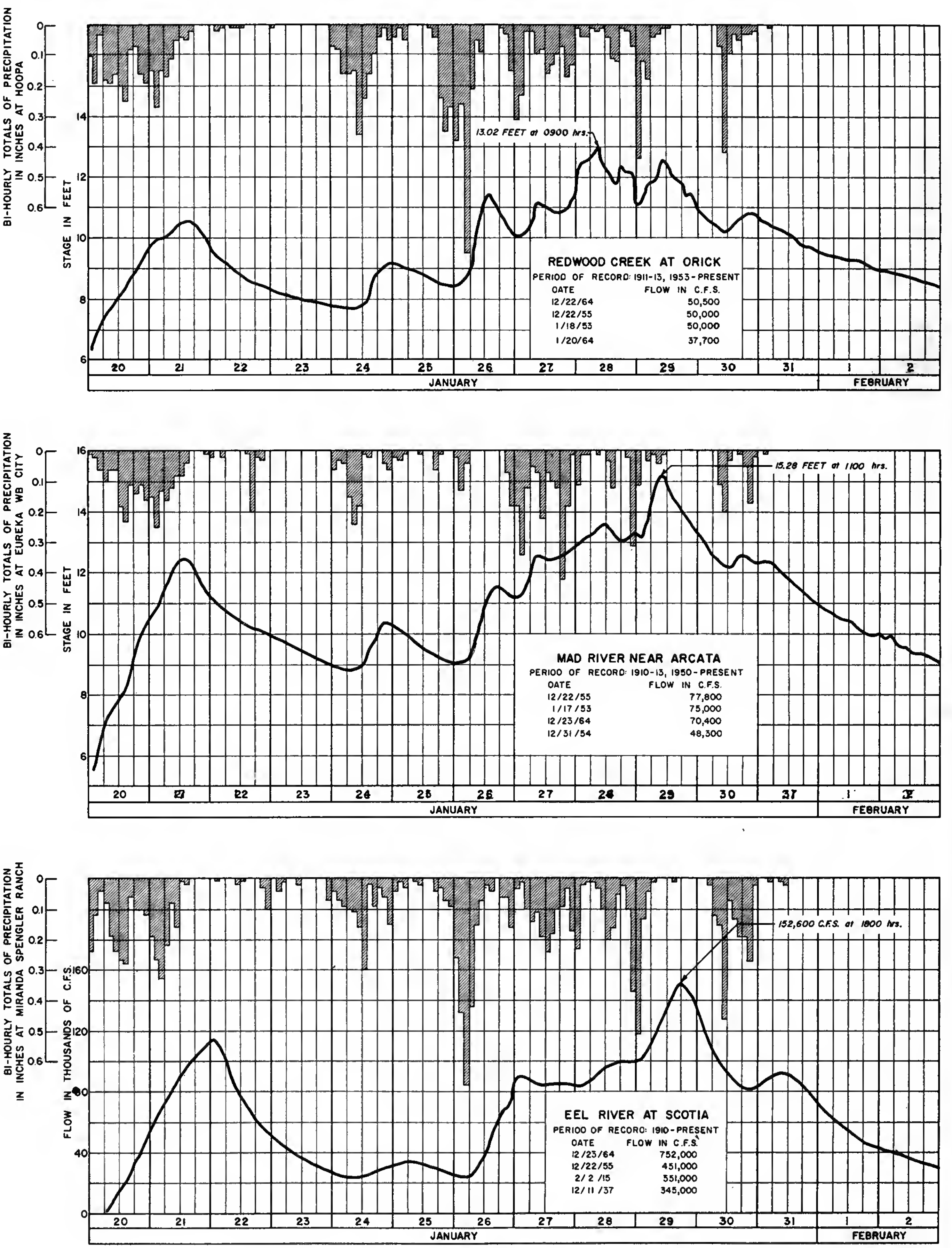
Sharp rises in Redwood Creek, which drains a relatively small area of 280 square miles, will occur almost immediately following intense rainfall over the basin. The December 1 to 8 storm totals of 12.31 inches of precipitation at Orick Prairie Creek station and 8.14 inches at Korbel were slightly less than the January 20 to February 2 storm totals of 13.54 inches and 9.46 inches at the same precipitation stations. The December storm, however, produced the season's peak stage on Redwood Creek at Orick of 15.81 feet. This was a very sharp peak, rising and falling rapidly. The runoff from the January storm, delineated on Plate 9, crested at 13.0 feet but sustained the high flows for a longer period of time than the December storm.

There was no flooding in the basin because the runoff from both storms crested below the 19-foot danger stage at Orick.

Eel River Basin

Intense precipitation during the early December and late January storms caused heavy runoff from the 3,700 square-mile Eel River Basin. At the Garberville precipitation station, 10.36 inches of rain fell during the December storm and 14.93 inches during the January 20 to February 2 storm. At Branscomb, 13.03 inches and 19.50 inches were reported for the two storms.

PLATE 9



HYDROGRAPHS OF REDWOOD CREEK, MAD AND EEL RIVERS

During both storms the Eel River at Scotia rose to 33 feet, cresting well below the 45-foot flood stage. However, downstream at Fernbridge, where the flood stage is 17 feet, the Eel River reached a peak of 18 feet on December 5, and 17.2 feet on January 29. The Van Duzen River, tributary to the Eel River, peaked near 18 feet at Bridgeville, or one foot above flood stage.

The Eel River, which has caused millions of dollars in damages in previous floods, inundated only the lowlands in the Fernbridge area. Livestock were moved to high ground and some families were evacuated, but flood damage was relatively minor.

Russian River Basin

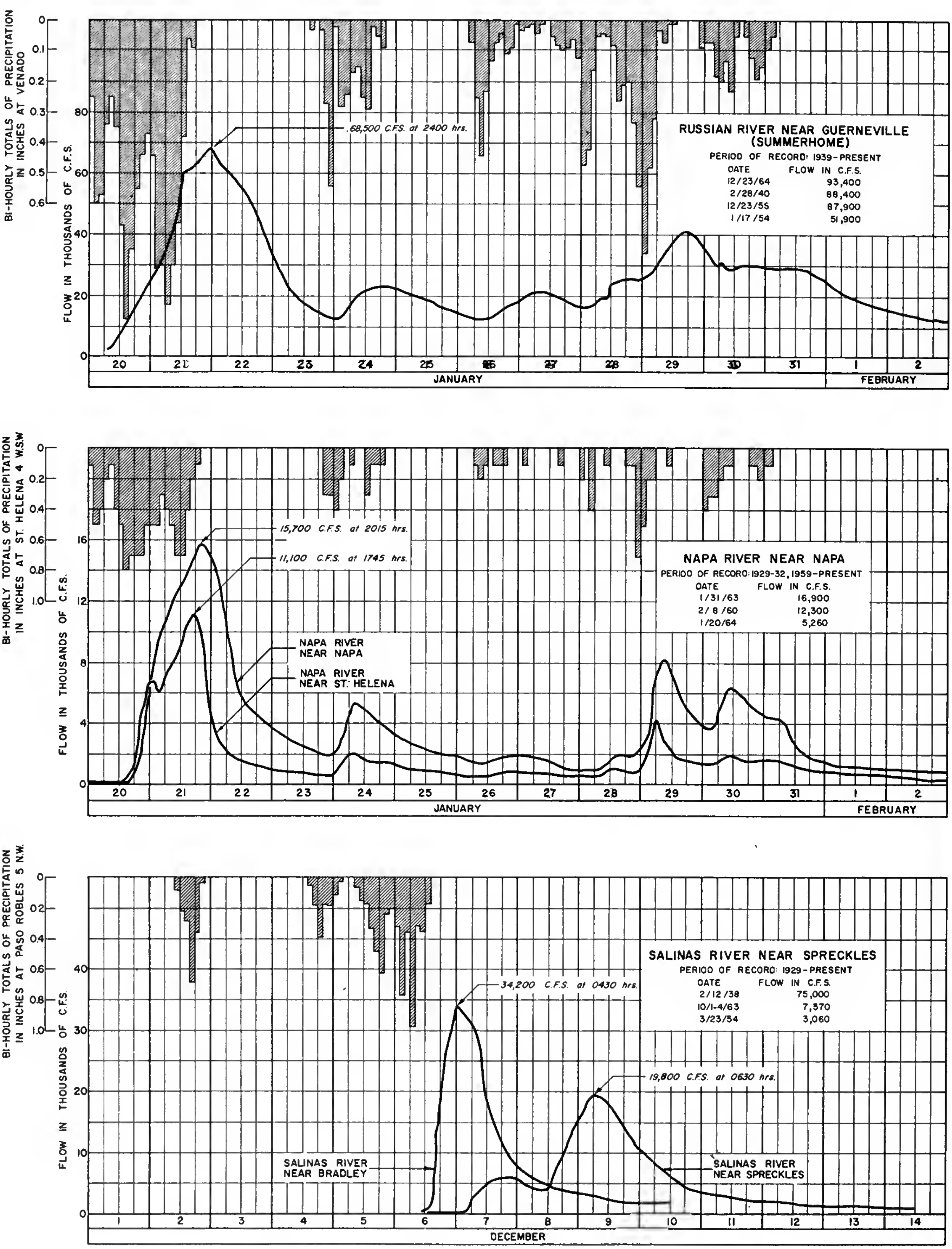
Rainfall amounts in the Russian River Basin were greater than in any of the other North Coastal basins. As a result, high river stages occurred along the entire length of the Russian River.

During the January-February storm, 16.34 inches of precipitation fell at Healdsburg; 15.05 inches at Ukiah; 21.03 inches at Occidental; and 23.86 inches at Cazadero. As a consequence, the peak inflow into Lake Mendocino (Coyote Dam) was 1,120 cfs on January 21. The reservoir reached its peak storage of 88,410 acre-feet on January 30. Downstream at Guerneville, the Russian River peaked near midnight on January 21 at 68,500 cfs. (42.45-foot stage). Flows were high, but high-water damage was relatively minor and confined to the lowlands and to unoccupied summer cabins along the river.

Table 4: North Coastal Area Runoff: January-February 1967 Storm

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage	Peak Flow	Jan. 20-Feb. 2 Runoff Volume		
				cfs-d*	Acre-Feet	Inches**
Trinity River at Hoopa	2,865	33.20	52,000	250,337	495,667	2.90
Russian River near Guerneville	1,340	41.94	67,000	355,244	703,383	9.83
Klamath River near Klamath	12,100	26.25	148,500	825,069	1,633,637	2.54
Napa River near Napa	218	26.47	15,800	44,039	87,197	7.50
Smith River near Crescent City	613	30.35	87,800	377,600	747,648	22.90
Eel River at Scotia	3,113	32.86	153,000	921,747	1,825,059	11.00
Klamath River at Orleans	8,480	23.88	98,040	438,380	867,992	1.92

* Volume of water represented by a flow of one cubic foot per second for 24 hours.
** Volume equivalent to inches of depth over drainage area.



HYDROGRAPHS OF RUSSIAN, NAPA AND SALINAS RIVERS

Central Coastal Hydrographic Area

During the December storm, record rainfall amounts were reported throughout the area. At the precipitation station Santa Margarita Booster, 7.90 inches of rain fell in the 24-hour period ending at 0800 December 6, and the three-day total amounted to 12.42 inches. Heavy rains also occurred in the Santa Cruz and the Santa Lucia Mountains. Rainfall amounts at selected stations are shown in Table 5.

The antecedent moisture conditions and the characteristics and intensity of the December storm caused near record peak flows on many streams in the Central Coastal area. However, the only basins which experienced major flooding were the Salinas River Basin and Santa Barbara and vicinity.

Table 5: Precipitation Totals (Dec. 4-7, 1966) at Selected Stations in Central Coastal Basins

Station	Drainage	Elevation (feet)	1-Day (inches)	3-Day (inches)
Santa Margarita Booster	Salinas	1100	7.90	12.42
Santa Margarita 2 SW	Salinas	1200	7.22	11.59
Salinas Dam	Salinas	1375	4.85	8.63
San Antonio Mission	Salinas	1060	6.35	9.07
Wrights	Santa Cruz	1600	2.73	4.74
Ben Lomond No. 2	Santa Cruz	375	3.93	6.76
Big Sur SP	Coastal	235	4.08	7.66

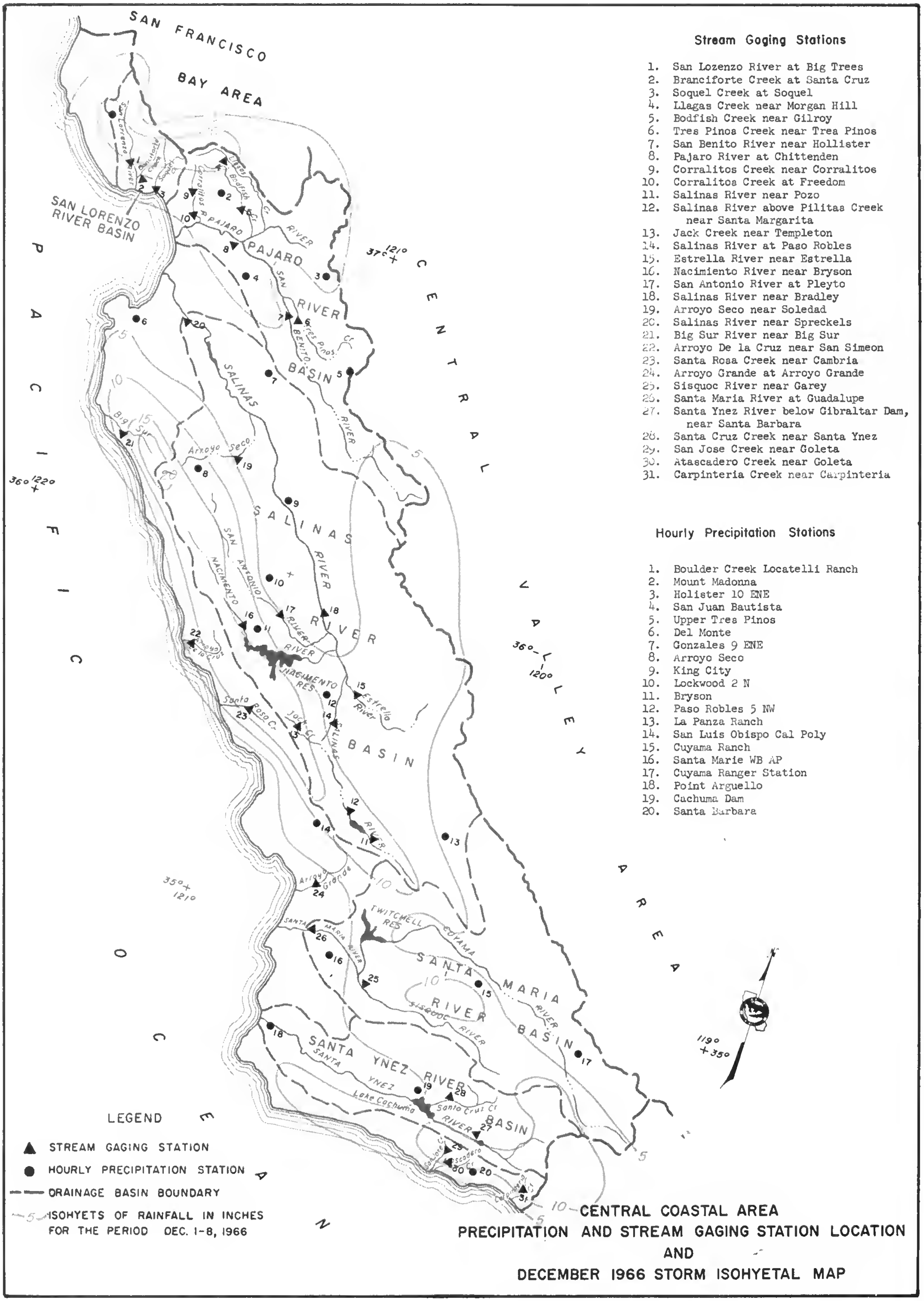
Salinas River Basin

The Salinas River drains an area of 4,550 square miles. The important tributaries are the Nacimiento River, San Antonio River and Arroyo Seco from the west and Estrella Creek and San Lorenzo Creek from the east. Due to the effect of topography on rainfall, the tributary area on the east side has relatively low annual precipitation and contributes less streamflow than the west side tributaries.

After a period of moderate to heavy rainfall has lowered the unusually high percolation and infiltration rates of the basin, an intense storm of two days or more duration will produce a rapid rise in runoff in the Salinas River and its tributaries. In December, favorable runoff conditions resulted in moderate flood peaks in the northern tributaries and record runoff from the southern tributaries.

The Salinas River at Bradley peaked at 34,200 cfs, 5,800 cfs more than the previous record of April 1958. The Estrella River near Estrella peaked at 17,600 cfs, approximately twice as high as the previous 1958 record of 8,850 cfs.

The only reason more areas of the Salinas Valley were not flooded was because of Nacimiento, San Antonio, and Salinas Reservoirs. On December 1, Nacimiento Reservoir contained 52,960 acre-feet of water. On December 8, it had 179,000 acre-feet in storage. San Antonio Reservoir gained 31,000 acre-feet from December 4 to December 8. The peak flow into Nacimiento Reservoir, which occurred on December 6, was 90,000 cfs. All inflow to the two reservoirs (San Antonio and Nacimiento) during the December storm was stored.



Stream Gaging Stations

1. San Lozenzo River at Big Trees
2. Branciforte Creek at Santa Cruz
3. Soquel Creek at Soquel
4. Llagas Creek near Morgan Hill
5. Bodfish Creek near Gilroy
6. Tres Pinos Creek near Trea Pinos
7. San Benito River near Hollister
8. Pajaro River at Chittenden
9. Corralitos Creek near Corralitos
10. Corralitoa Creek at Freedom
11. Salinas River near Pozo
12. Salinaa River above Pilitas Creek near Santa Margarita
13. Jack Creek near Templeton
14. Salinas River at Paso Robles
15. Estrella River near Estrella
16. Nacimiento River near Bryson
17. San Antonio River at Pleyto
18. Salinas River near Bradley
19. Arroyo Seco near Soledad
20. Salinas River near Spreckels
21. Big Sur River near Big Sur
22. Arroyo De la Cruz near San Simeon
23. Santa Rosa Creek near Cambria
24. Arroyo Grande at Arroyo Grande
25. Sisquoc River near Garey
26. Santa Maria River at Guadalupe
27. Santa Ynez River below Gibraltar Dam, near Santa Barbara
28. Santa Cruz Creek near Santa Ynez
29. San Jose Creek near Goleta
30. Atascadero Creek near Goleta
31. Carpinteria Creek near Carpinteria

Hourly Precipitation Stations

1. Boulder Creek Locatelli Ranch
2. Mount Madonna
3. Holister 10 ENE
4. San Juan Bautista
5. Upper Trea Pinos
6. Del Monte
7. Gonzales 9 ENE
8. Arroyo Seco
9. King City
10. Lockwood 2 N
11. Bryson
12. Paso Robles 5 NW
13. La Panza Ranch
14. San Luis Obispo Cal Poly
15. Cuyama Ranch
16. Santa Marie WB AP
17. Cuyama Ranger Station
18. Point Arguello
19. Cachuma Dam
20. Santa Barbara

CENTRAL COASTAL AREA
PRECIPITATION AND STREAM GAGING STATION LOCATION
AND
DECEMBER 1966 STORM ISOHYETAL MAP

Salinas Dam has no provision for flood control other than the incidental effect in reducing some flood peaks when water supply storage space is available. The Salinas Reservoir spilled during the December flood.

The Monterey County Flood Control District estimates that the peak discharge of the Salinas River near Spreckels would have been 80,000 cfs if the reservoirs had not been constructed. This would have been slightly higher than the flood of record which occurred February 1938, when 75,000 cfs was recorded. The actual peak flow, occurring December 9, was 19,800 cfs.

Plate 10 delineates the flow hydrograph of the Salinas River near Spreckels and Bradley during the high flow period.

The reservoirs were unable to prevent all flood damage. An estimated 32,900 acres of pasture and agricultural lands were flooded. Along the entire length of the Salinas River it was necessary to move cattle to the safety of high ground. The damage to agricultural lands consisted mostly of scouring and deposition of silt, gravel, and debris. Heavy losses to crops and to some new plantings occurred. Numerous farm houses and outbuildings received high-water damage.

Many roads were closed because of inundation or bridge damage. The Gonzales sewage treatment plant ponds were completely inundated. The Chular County dump was flooded and the Chular sewage treatment plant damaged.

During the December 1966 flood, one life was lost on the Arroyo Seco. The U. S. Corps of Engineers estimated the flood damage in the Salinas River Basin totaled $6,138,000 with an additional $434,000 storm damage loss.

Table 6: Summary of Flood Damages
Central Coastal Area - Salinas River Basin

Stream & Reach	Primary Flood Damage in $1000					
	Agricultural	Residential	Commercial	Industry & Utilities	Public Facilities	Total
Salinas River						
Mouth to Hilltown Bridge	230	0	0	0	33	263
Hilltown Bridge to Chular Bridge	1,300	0	0	5	30	1,335
Chular Bridge to Gonzales Bridge	320	0	0	0	50	370
Gonzales Bridge to Soledad Bridge	530	0	0	0	45	575
Soledad Bridge to Metz Road	445	0	0	0	35	480
Metz Road to Union Carbide Plant	260	0	10	0	40	310
Union Carbide Plant to San Ardo Bridge	145	0	0	0	35	180
San Ardo to San Luis Obispo County Line	20	0	0	520	75	615
San Luis Obispo County Line to Highway 41 Bridge	110	20	5	10	67	212
Highway 41 Bridge, Paso Robles to Highway 41 Bridge, Atascadero	250	0	0	35	98	383
Highway 41 Bridge, Atascadero to Salinas Reservoir	100	0	35	550	128	813
Arroyo Seco	45	10	55	0	37	147
Camp Hunter Liggett	0	0	0	0	455	455
TOTAL SALINAS RIVER BASIN	3,755	30	105	1,120	1,128	6,138

Santa Barbara and Vicinity

The drainage area of the south slope of the Santa Ynez Mountains contains numerous streams. Due to the steep gradients on the upper reaches of these streams, rapid and concentrated flows emerge from the canyons, and flow into highly developed urban and surburban areas.

The principal streams in the basin include Tecolotito and Carneros Creeks, which flow into Goleta Slough; Atascadero Creek and its numerous tributaries, which also flow into Goleta Slough; San Roque Creek, which skirts the west end of the city of Santa Barbara; Mission Creek, which flows through Santa Barbara; Sycamore Creek, which flows through the eastern portion of Santa Barbara; Montecito, Oak, San Ysidro, and Picay Creeks, which drain the community of Montecito; and Santa Monica, Franklin, and Carpinteria Creeks, which flow in and near the community of Carpinteria.

Santa Barbara and vicinity had sustained minor flood damage during the December storm but suffered extensive damage during the January storm, when flows actually exceeded channel capacities and where bridge openings were plugged by debris. The flood flow from Tecolotito Creek, together with the flows from Carneros and San Pedro Creeks, resulted in the floodings of nearly the entire Santa Barbara airport. Major flooding occurred on the lower reach of Mission Creek, where the lack of adequate channel capacity and bridge openings caused overflow into residential areas. Flooding into residential areas also occurred near Cieneguitas Creek. Principal damage in many locations was from the heavy deposition of mud in and around buildings and in the streets.

Although Santa Barbara County was not declared a disaster area, the estimated flood damages amounted to $1.1 million.

SOUTH COASTAL HYDROGRAPHIC AREA

The area comprises all basins draining into the Ocean between the southeastern boundary of Ricon Creek Basin in Ventura County and the California-Mexico boundary, not including the portion of the Tia Juana Basin, which lies in Mexico. North and east of the area lie the Tehachapi, San Gabriel, San Bernardino, and San Jacinto Mountains and the coastal ranges of San Diego County. The higher peaks exceed 9,000 feet in elevation, and numerous ridges rise above 5,000 feet.

Precipitation in the area as a whole is usually moderate, and almost entirely confined to winter months. High intensities, however, often accompany rains in the mountains.

The storms that moved across the area in December and January brought high-intensity rainfall. Rainfall as high as three inches in three hours was reported. The coastal streams responded immediately and flows were relatively high, causing extensive flood damage.

San Bernardino, Riverside and San Diego Counties

Precipitation amounts were greater than normal during December and January. Long Beach reported the wettest December since 1951, and the wettest January since 1956. Runoff from heavy rains resulted in intense flows which damaged dams, stream channels and levees.

City storm-drain systems were unable to carry the rainfall runoff, and as drains became choked, backwater spread into developed areas. In San Diego, sections of highways collapsed when running water got under the pavement. In San Bernardino and Riverside Counties, streets were flooded and sections of highways and bridges were damaged.

Local flooding was reported from many points. Mud slides damaged homes and closed highways and city streets. In Redlands, San Bernardino, and Indio, facilities such as water mains and sewers were severely damaged. Stream channels were seriously eroded causing the deposition of large amounts of debris in downstream areas.

As the storm damage continued, the counties of Riverside and San Bernardino, and the City of Escondido in San Diego County were declared disaster areas.

Lahontan Hydrographic Area (Southern Portion)

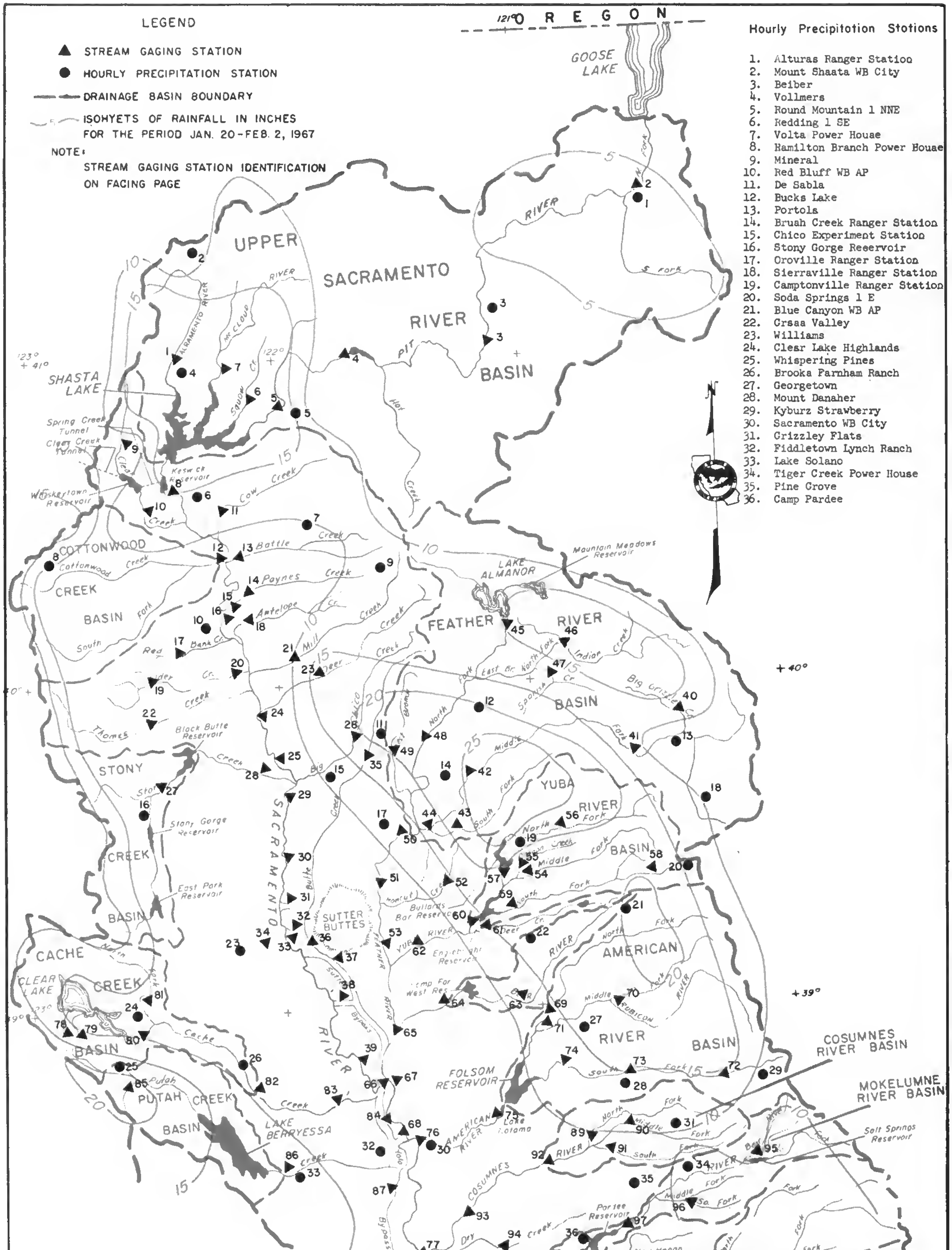
In the Owens Valley rainfall is usually light. However, during the December 2-6, 1966 storm, 5.79 inches of precipitation was recorded at the Bishop Airport. This is 4.61 inches above normal for the month of December. Farther south at Independence 9.90 inches of precipitation fell during the same storm period; 8.73 inches above normal for that area.

The intense storm caused extensive damage to highways and secondary roads and especially to the Los Angeles Aqueduct. Inyo County was declared a disaster area.

Table 7 : Summary of Flood Damages in Declared Disaster Areas in Southern California

Area		Estimated Damages*
Riverside County		
Public Damage		$1,891,000
Private Damage		1,750,000
	Total	$3,641,000
San Bernardino County		
Public Damage		$2,946,000
Private Damage		1,001,000
	Total	$3,947,000
Inyo County		
Public Damage		$ 990,000
Private Damage		160,000
	Total	$1,150,000
City of Escondido (San Diego County)		
Public Damage		$ 140,000
Private Damage		350,000
	Total	$ 490,000

* Damage Estimates Compiled by California Disaster Office



CENTRAL VALLEY - SACRAMENTO RIVER DRAINAGE PRECIPITATION AND STREAM GAGING STATION LOCATION AND JANUARY 1967 STORM ISOHYETAL MAP

CENTRAL VALLEY HYDROGRAPHIC AREA

Stream Gaging Stations

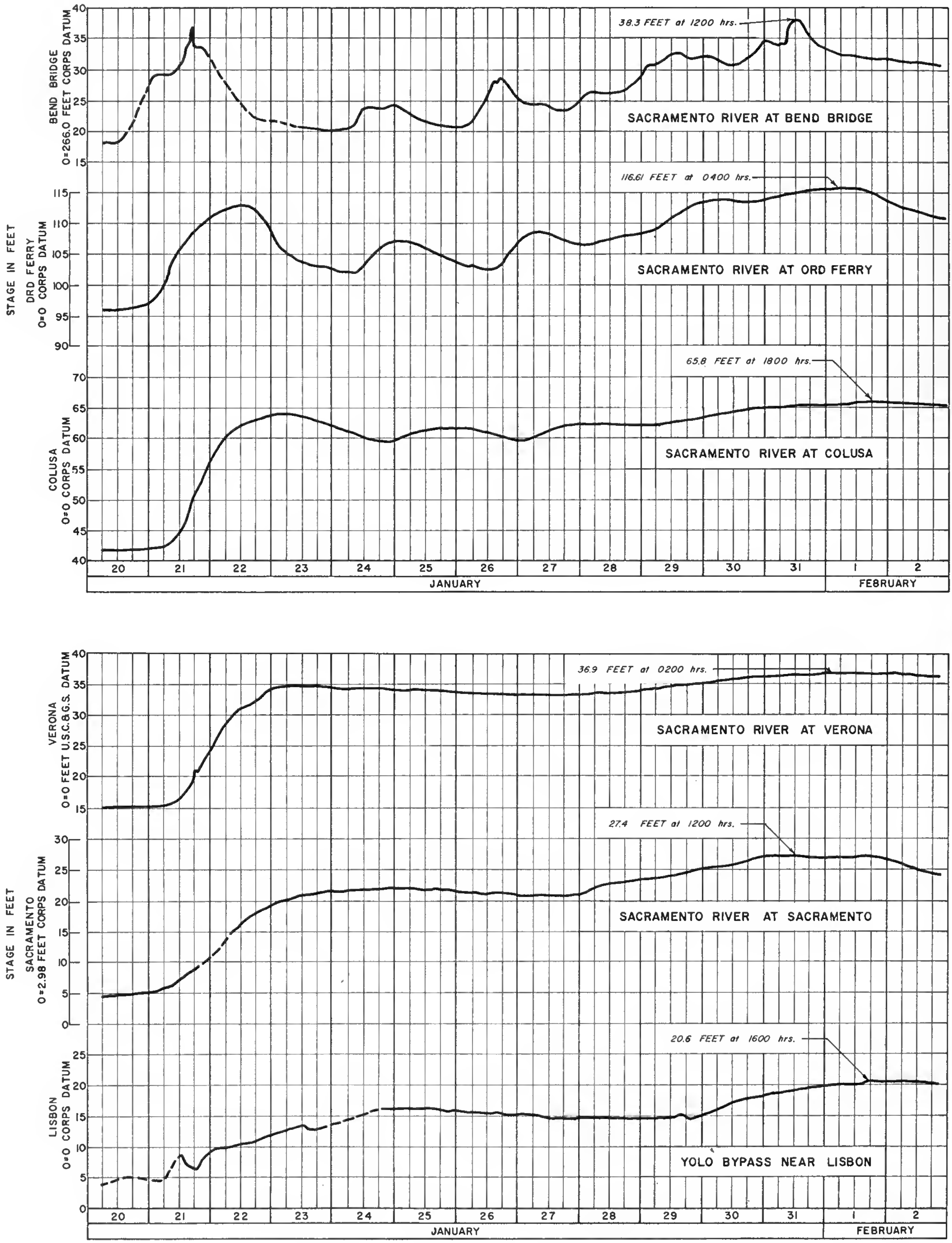
1. Sacramento River at Delta
2. North Fork Pit River near Alturas
3. Pit River near Bieber
4. Pit River below Pit No. 4 Dam
5. Pit River near Montgomery Creek
6. Squaw Creek above Shasta Lake
7. McCloud River above Shasta Lake
8. Sacramento River at Keswick
9. Clear Creek at French Gulch
10. Clear Creek near Igo
11. Cow Creek near Igo
12. Cottonwood Creek near Cottonwood
13. Battle Creek below Coleman Fish Hatchery near Cottonwood
14. Paynes Creek near Red Bluff
15. Sacramento River near Red Bluff
16. Sacramento River at Red Bluff
17. Red Bank Creek near Red Bluff
18. Antelope Creek near Red Bluff
19. Elder Creek near Paskenta
20. Elder Creek at Gerber
21. Mill Creek near Los Molinos
22. Thomes Creek at Paskenta
23. Deer Creek near Vina
24. Sacramento River at Vina Bridge
25. Sacramento River at Hamilton City
26. Big Chico Creek near Chico
27. Stony Creek near Fruto
28. Stony Creek near Hamilton City
29. Sacramento River at Ord Ferry
30. Sacramento River at Butte City
31. Moulton Weir Spill to Butte Basin
32. Colusa Weir Spill to Butte Basin
33. Sacramento River at Colusa
34. Colusa Basin Drain at Highway 20
35. Butte Creek near Chico
36. Butte Slough to Sutter Bypass at Mawson Bridge
37. Sutter Bypass at Long Bridge
38. Tisdale Weir Spill to Sutter Bypass
39. Sacramento River at Knights Landing
40. Big Grizzley Creek near Portola
41. Middle Fork Feather River near Clio
42. Middle Fork Feather River near Merrimac
43. South Fork Feather River at Enterprise
44. Feather River at Bidwell Bar
45. North Fork Feather River near Prattville
46. Indian Creek near Crescent Mills
47. Spanish Creek above Blackhawk Creek, at Keddie
48. North Fork Feather River at Pulga
49. West Branch Feather River near Paradise
50. Feather River at Oroville
51. Feather River near Gridley
52. South Honcut Creek near Bangor
53. Feather River at Yuba City
54. Middle Yuba River above Oregon Creek
55. Oregon Creek near North San Juan
56. North Yuba River below Goodyears Bar
57. North Yuba River below Bullards Bar Dam
58. South Yuba River near Cisco
59. South Yuba River at Jones Bar
60. Yuba River at Englebright Dam
61. Deer Creek near Smartville
62. Yuba River near Marysville
63. Bear River near Auburn
64. Bear River near Wheatland
65. Feather River at Nicolaus
66. Sacramento River at Fremont Werr
67. Sacramento River at Verona
68. Sacramento Weir Spill to Yolo Bypass, near Sacramento
69. North Fork American River at North Fork Dam
70. Rubicon River near Foresthill
71. Middle Fork American River near Auburn
72. South Fork American River near Kyburz

The December and January storms began in the typical pattern which usually spells trouble for the Central Valley. Gale warnings were flown from Point Reyes to Point Conception, and wind velocities were upward of 70 mph in the Sacramento Valley. Precipitation ranged as high as 170 percent of normal. Widespread flooding occurred throughout the Central Valley during the series of storms which swept the Central Valley during December 1966 and January 1967.

Sacramento River Basin

The December 1-16 storm deposited an average of 6.8 inches of precipitation over the basin. Runoff was largest on the upper Sacramento River. The high intensity of the storm propelled the instantaneous peak inflow of 91,280 cfs into Shasta Lake. On December 8, flood control releases from Shasta Dam were increased to the season's maximum of 49,540 cfs. Heavy local inflow between Shasta Dam and Red Bluff, combined with Shasta Dam releases, resulted in the peak flow , during the storm, of 59,000 cfs on December 3 at the Ord Ferry gage.

73. South Fork American River near Camino
74. South Fork American
75. American River at Fair Oaks
76. Sacramento River at Sacramento
77. Sacramento River at Walnut Grvve
78. Adobe Creek near Kelseyville
79. Kelsey Creek near Kelseyville
80. Cache Creek near Lower Lake
81. North Fork Cache Creek near Lower Lake
82. Cache Creek near Capay
83. Cache Creek at Yolo
84. Yolo Bypass near Woodland
85. Dry Creek near Middletown
86. Putah Creek near Winters
87. Yolo Bypass near Lisbon
88. Sacramento River near Rio Vista
89. North Fork Cosumnes River near El Dorado
90. Middle Fork Cosumnes River near Somerset
91. South Fork Cosumnes River near River Pines
92. Cosumnes River at Michigan Bar
93. Cosumnes River at McConnell
94. Dry Creek near Galt
95. Cole Creek near Salt Springs Dam
96. South Fork Mo elumne River near West Point
97. Mokelumne River near Mokelumne Hill
98. Modelumne River at Woodbridge



GAGE HEIGHTS OF SACRAMENTO RIVER AND YOLO BYPASS

From January 20 to February 2, 15.08 inches of precipitation were measured at Shasta Dam; 20.83 inches at Brush Creek Ranger Station; 19.75 inches at Blue Canyon, and 7.92 inches on the valley floor at Sacramento. The basin average was 11.9 inches, or 70 percent above the monthly normal. Heavy runoff during the January storm caused several foothill and valley streams to overflow and caused local flooding. Flows in the Sacramento River and major tributaries were above normal but well below project design flows. Releases from Shasta Lake were controlled to a maximum mean daily outflow of 36,700 cfs during the storm.

On the Yuba River, the peak spill from Englebright Reservoir was 43,000 cfs on January 21. On the Feather River at Yuba City, a peak stage of 62.4 feet, well below the danger stage of 79.4 feet, occurred on January 31. On the American River, the maximum mean daily release from Folsom Dam was 36,100 cfs on January 31. The maximum daily mean inflow to Folsom Reservoir during January was 27,050 cfs. Maximum flows in the American River were well below project design flows.

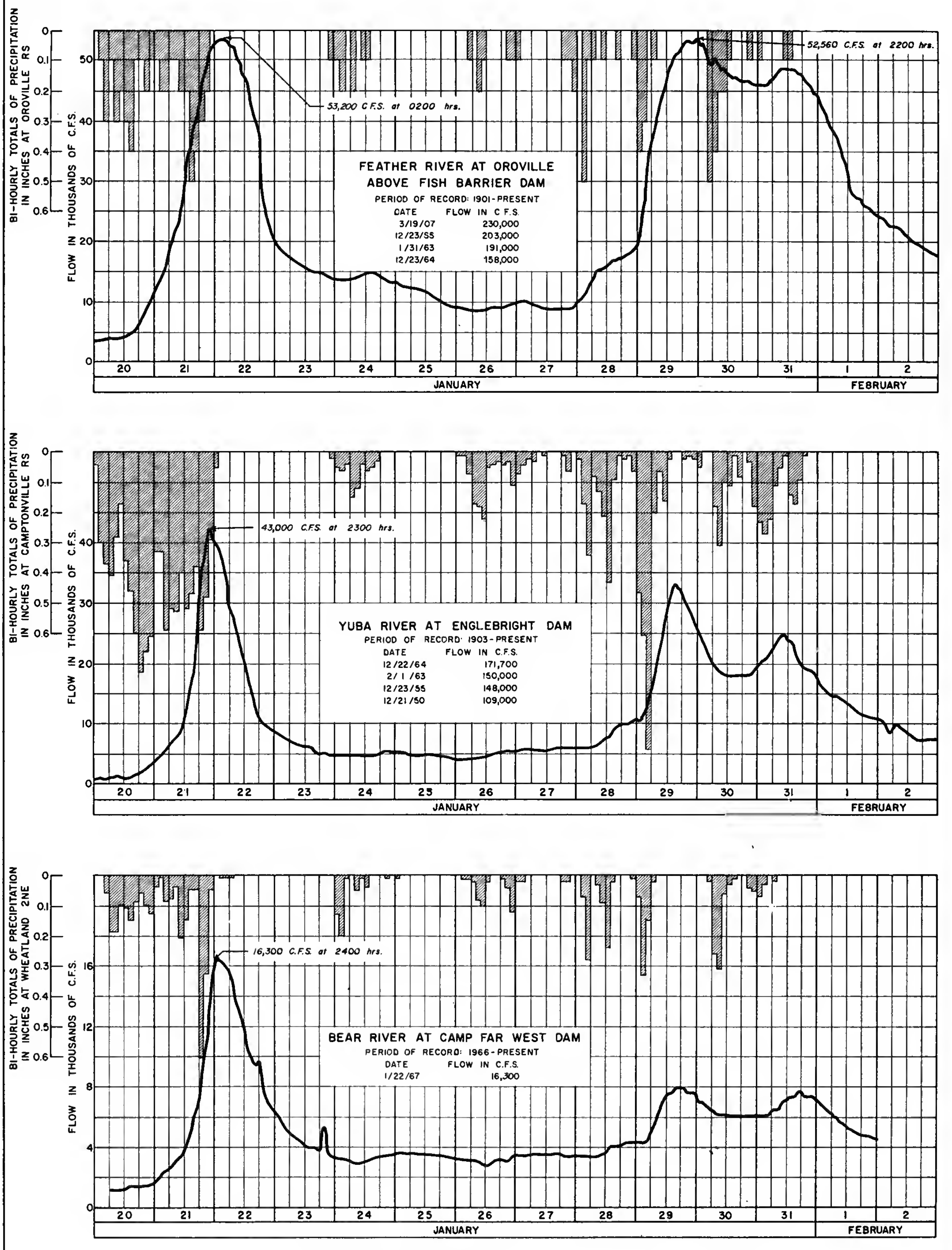
In the Sacramento River Basin, 219,000 acres were flooded. Virtually all of the flooded area was cropland, orchards, pasture or grazing land within the confines of flood channels and overflow basins. A large area flooded was the Colusa Basin, a natural overflow trough of the Sacramento River.

Table 9 shows the periods of overflow into the Sutter Bypass at Moulton, Colusa and Tisdale Weirs, and overflow into Yolo Bypass by Fremont Weir. Plate 33 shows record of inundation of the Yolo Bypass (1914 to 1967).

Plates 20 and 21 show stages of the Sacramento River, Yolo Bypass, Feather, Yuba, and Bear Rivers at various points.

Table 8: Summary of Flooded Areas and Damages
Central Valley Area - Sacramento River Basin

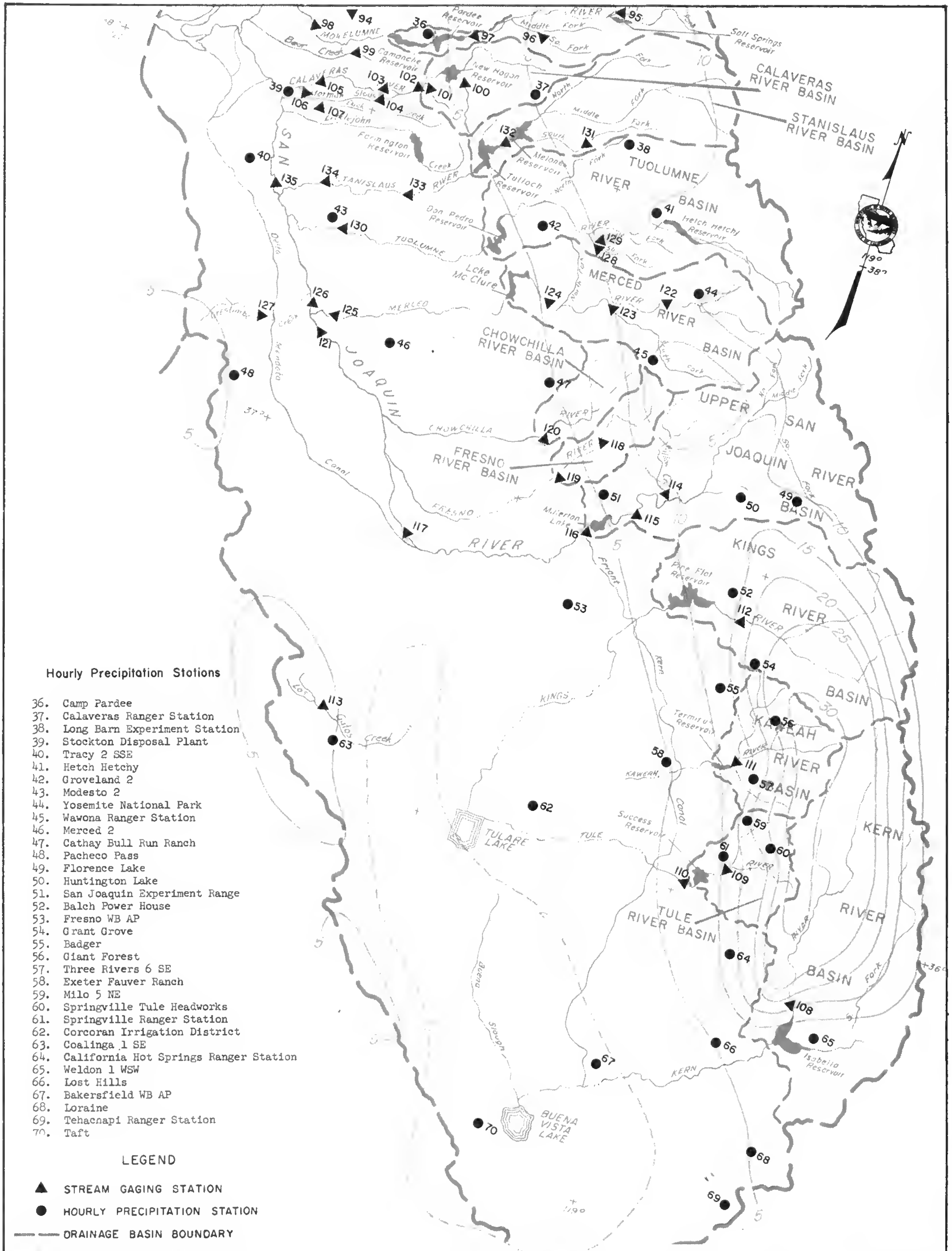
Stream & Reach	Acres Flooded	Primary Flood Damage in $1,000					
		Agricultural	Residential	Commerical	Industry & Utilities	Public Facilities	Total
Sacramento R. Basin above Shasta Dam	90	0	2	0	0	2	4
Sacramento R. Basin below Shasta Dam	15,300	261	16	8	0	13	298
Feather River Basin	12,030	213	0	0	0	1	214
Yuba River Basin	0	0	0	0	0	0	0
Bear River Basin	0	0	0	0	0	0	0
Coon Creek Stream Group	12,900	283	0	0	7	1	291
American River Basin	1,880	10	3	2	0	1	16
Redding Stream Group	0	0	0	0	0	0	0
Stony Creek Basin	630	69	0	0	0	0	69
Middle Sacramento R. Tributaries, East side	420	4	0	0	0	0	4
Middle Sacramento R. Tribu-					0		
taries, West Side	470	14	2	1	0	0	17
Butte Basin Area	69,000	656	0	9	0	5	670
Colusa Basin & Tributary Streams	33,500	155	0	0	0	22	177
Cache Creek Basin	5,190	96	0	0	0	3	99
Putah Creek Basin	430	9	1	0	0	10	20
Cache Slough & Tributaries	0	0	0	0	0	0	0
Project Bypasses & Ship Channel	64,000	639	0	0	0	25	664
Sacramento-San Joaquin Delta Islands & Suisun Bay	2,940	10	50	40	1	10	111
TOTAL SACRAMENTO R. BASIN	218,780	2,419	74	60	8	93	2,654



HYDROGRAPHS OF FEATHER, YUBA AND BEAR RIVERS

Table 9: Sacramento River Flood Control Project Weir Overflow Data

Weir	Flood Stage in Feet	Weir Overflow Dates From-	Weir Overflow Dates To-	Crest Stage	Crest Date
Moulton Weir	76.8	1530 hr. Jan. 22	1200 hr. Jan. 23	78.27	0200 hr. Jan. 23
		1800 hr. Jan. 29	0930 hr. Feb. 5	80.80	1800 hr. Feb. 1
Colusa Weir	61.8	1115 hr. Dec. 3	0010 hr. Dec. 13	64.77	1730 hr. Dec. 6
		0345 hr. Jan. 22	1430 hr. Jan. 24	65.71	0530 hr. Jan. 23
		2320 hr. Jan. 24	2210 hr. Jan. 26	63.69	1900 hr. Jan. 25
		0150 hr. Jan. 27	1130 hr. Feb. 10	67.10	2245 hr. Feb. 1
		1130 hr. Apr. 20	1430 hr. Apr. 21	62.07	2200 hr. Apr. 20
		0045 hr. Apr. 25	1545 hr. Apr. 29	62.63	1630 hr. Apr. 28
Tisdale Weir	45.5	1615 hr. Nov. 21	1345 hr. Nov. 22	46.39	0100 hr. Nov. 22
		1600 hr. Nov. 30	1215 hr. Dec. 1	46.03	0030 hr. Dec. 1
		0500 hr. Dec. 3	1245 hr. Dec. 17	48.29	1345 hr. Dec. 10
		0900 hr. Jan. 22	1245 hr. Feb. 14	48.91	0545 hr. Feb. 2
		2200 hr. Mar. 17	1100 hr. Mar. 19	46.57	1130 hr. Mar. 18
		0015 hr. Apr. 19	1230 hr. May 3	47.49	0600 hr. Apr. 27
		2000 hr. May 23	2215 hr. May 27	46.08	0600 hr. May 26
Fremont Weir	33.50	0740 hr. Dec. 4	0040 hr. Dec. 15	35.50	1545 hr. Dec. 7
		1730 hr. Jan. 22	1740 hr. Feb. 4	37.22	0700 hr. Feb. 1
		0200 hr. Mar. 18	1000 hr. Mar. 22	35.01	0640 hr. Mar. 19
		1800 hr. May 24	0830 hr. May 29	34.15	0500 hr. May 27



Hourly Precipitation Stations

36. Camp Pardee
37. Calaveras Ranger Station
38. Long Barn Experiment Station
39. Stockton Disposal Plant
40. Tracy 2 SSE
41. Hetch Hetchy
42. Groveland 2
43. Modesto 2
44. Yosemite National Park
45. Wawona Ranger Station
46. Merced 2
47. Cathay Bull Run Ranch
48. Pacheco Pass
49. Florence Lake
50. Huntington Lake
51. San Joaquin Experiment Range
52. Balch Power House
53. Fresno WB AP
54. Grant Grove
55. Badger
56. Giant Forest
57. Three Rivers 6 SE
58. Exeter Fauver Ranch
59. Milo 5 NE
60. Springville Tule Headworks
61. Springville Ranger Station
62. Corcoran Irrigation District
63. Coalinga 1 SE
64. California Hot Springs Ranger Station
65. Weldon 1 WSW
66. Lost Hills
67. Bakersfield WB AP
68. Loraine
69. Tehachapi Ranger Station
70. Taft

LEGEND

▲ STREAM GAGING STATION
● HOURLY PRECIPITATION STATION
DRAINAGE BASIN BOUNDARY
ISOHYETS OF RAINFALL IN INCHES FOR THE PERIOD DEC. 1-8, 1966

NOTE:
STREAM GAGING STATION INDENTIFICATION ON FACING PAGE

CENTRAL VALLEY – SAN JOAQUIN RIVER – TULARE LAKE DRAINAGE
PRECIPITATION AND STREAM GAGING STATION LOCATION
AND
DECEMBER 1966 STORM ISOHYETAL MAP

Table 10 : Precipitation Totals - Southern Sierra Nevada Basins

Name	Drainage	Elevation (feet)	1-Day (inches)	3-Day (inches)
Giant Forest	Kaweah	6,412	12.90	21.74
Grant Grove	Kings	6,600	10.09	17.85
Springville 7 ENE	Tule	2,470	8.46	17.39
Three Rivers Edison Ph	Kaweah	950	7.90	10.10
Ash Mountain	Kaweah	1,708	7.33	12.89
The three-day totals of these stations were 1.5 to 2.0 times the three-day precipitation amounts exceeded, on the average, once in ten years.				

Stream Gaging Stations

94. Dry Creek near Galt
95. Cole Creek near Salt Springs Dam
96. South Fork Mokelumne River near West Point
97. Mokelumne River near Mokelumne Hill
98. Mokelumne River at Woodbridge
99. Bear Creek near Lockeford
100. South Fork Calaveras River near San Andreas
101. Cosgrove Creek at Valley Springs
102. Calaveras River at Jenny Lind
103. Calaveras River at Bellota
104. Mormon Slough at Bellota
105. Calaveras River near Stockton
106. Stockton Diverting Canal at Stockton
107. Duck Creek near Stockton
108. Kern River at Kernville
109. Tule River near Springville
110. Tule River below Success Dam
111. Kaweah River at Three Rivers
112. Kings River below North Fork
113. Los Gatos Creek above Nunez Canyon near Coalinga
114. Willow Creek at Mouth near Auberry
115. San Joaquin River below Kerchoff Powerhouse
116. San Joaquin River below Friant
117. San Joaquin River near Mendota
118. Fresno River near Knowles
119. Fresno River near Daulton
120. Chowchilla River at Buchanan Dam Site, near Raymond
121. San Joaquin River at Fremont Ford Bridge
122. Merced River at Pohono Bridge, near Yosemite
123. Merced River South Fork near El Portal
124. Merced River at Bagby
125. Merced River near Stevinson
126. San Joaquin River near Newman
127. Orestimba Creek near Newman
128. South Fork Tuolumne River near Oakland
129. Middle Fork Tuolumne River at Oakland Recreation Camp
130. Tuolumne River at Modesto
131. South Fork Stanislaus River near Long Barn
132. Stanislaus River below Melones Powerhouse, near Sonora
133. Stanislaus River at Orange Blossom Bridge
134. Stanislaus River at Ripon
135. San Josquin River near Vernalis

San Joaquin River Basin

During the period December 1 to 7, two storm waves brought rain below the 6,000-foot elevation, rain and snow from 6,000 feet to 8,000 feet, and snow above the 8,000-foot elevation.

An average of six inches of precipitation fell over the basin, which is 70 percent above the monthly normal. During the January 20 to 31 storm, an average of 4.7 inches of precipitation fell over the basin.

The largest runoff occurred on the San Joaquin River above Millerton Lake during the December storm. The maximum mean daily inflow to Millerton Lake was 18,450 cfs, which occurred on December 6. During the storm period, releases to the river were only 52 cfs.

In the San Joaquin River Basin, 35,000 acres were flooded with damages over $1,350,000. Extensive damage occurred to powerplant facilities on the San Joaquin River above Millerton Lake. Agricultural losses occurred on the Fresno and Chowchilla Rivers and on various unregulated streams in Madera and Merced Counties. Losses also occurred along the Cosumnes River and Morrison Creek. Relatively minor damage occurred to residential and commercial properties.

Table 11: Summary of Flooded Areas and Damages
Central Valley Area - San Joaquin River Basin

Stream & Reach	Acres Flooded	Primary Flood Damage in $1,000 Agri-cultural	Resi-dential	Commercial	Industry & Utilities	Public Facilities	Total
Morrison Cr. & Beach Stone Lake Area	8,070	100	0	0	0	4	104
Cosumnes River Basin	11,210	229	0	0	2	33	264
Madera County Stream Group							
Chowchilla River below Buchanan Dams	1,700	66	0	0	0	35	101
Fresno River below Hidden Dam Site	8,330	73	0	0	0	87	160
Cottonwood Creek	2,180	53	0	0	0	34	87
Schmidt Creek	1,600	4	1	0	4	1	10
Dry Creek	820	37	0	0	2	8	47
Berenda Creek	450	5	0	0	0	0	5
San Joaquin River							
Above Friant Dam	---	0	0	0	565	5	570
Below Friant Dam	400	1	0	0	0	1	2
Westside Tributaries	---	0	0	0	0	2	2
Total	34,760	568	1	0	573	210	1,352

Courtesy Hammond's Studio, Porterville, California

Tulare Lake Basin

Tulare Lake Basin is composed of the drainage basins of the Kings, Kaweah, Tule and Kern Rivers. These streams all rise in the Sierra Nevada, in Kern and Tulare Counties, and with the exception of the North Branch of the Kings River, terminate in the Tulare or Buena Vista lakebeds.

Kern and Tulare Counties bore the brunt of the December 1-6 storm as it swung southward through the State. The initial wave of the storm brought light rain to the basin, but mid-day on December 5, a strong inflow of warm, moist air moved inland, causing an increase in the storm intensity. Torrential rains occurred in the basin foothills and mountains and continued until mid-day December 6. During the storm period, 20 to 30 inches of precipitation fell in the mountain areas of the Kings, Kaweah, Tule and Kern Rivers. At Johnsondale, in the Upper Kern River Basin, 14.94 inches of precipitation fell in the 24-hour period ending at 0800 on December 6, and 27.30 inches in the three-day period ending on the morning of the 7th. Other stations in the area reporting large totals as shown in Table 8.

On December 6, the mountain streams of Kern and Tulare Counties, swollen by this intense rainfall, sent a crush of flood waters surging into the lower San Joaquin Valley foothill areas. Previous peak flows were exceeded in the Kern, Kaweah and Tule Rivers.

The raging Tule River had a record peak flow of 49,600 cfs near Springville, well above the previous maximum flow of 10,100 cfs in 1963. At the beginning of the storm, Success Reservoir on the Tule River had 7,300 acre-feet of water in storage. On December 6, it was filled to its 85,000 acre-feet capacity. Even as the reservoir spilled, the water level continued to rise and finally reached a peak storage of 101,300 acre-feet on December 7. The peak inflow to Success Reservoir was 61,000 cfs, which occurred December 6, and on the following day the peak discharge of 8,800 cfs occurred.

Isabella Reservoir, on the Kern River, recorded a peak inflow of 120,000 cfs on December 6 but released a maximum amount of only 430 cfs. After the storm, releases from Isabella Reservoir were gradually increased, but the reservoir continued to impound water until December 29, when the discharge began to exceed the inflow. In 21 days, the reservoir had gained 154,800 acre-feet in storage and was approximately half-full.

The Kaweah River at Three Rivers recorded a peak flow of 73,000 cfs on December 5, well above the previous record of 30,900 cfs in 1963. Terminus Reservoir, on the Kaweah River, had a peak inflow of 105,000 cfs on December 6, and a peak discharge of 5,100 cfs. The reservoir gained 139,400 acre-feet in storage from December 1 to December 7.

Preliminary estimates indicate that the three dams (Isabella, Success, and Terminus) prevented an additional $80 million damages from occurring during the December storm. The inflow to the three reservoirs exceeded all previous record flows, but releases downstream were generally contained within the stream channels. Some flooding occurred in agricultural areas downstream from Success Reservoir, partially because of uncontrolled spill during December 6 to December 10.

Table 12: Summary of Flooded Areas and Damages
Central Valley Area - Tulare Lake Basin

Stream & Reach	Acres Flooded	Primary Flood Damage in $1,000					
		Agri-cultural	Resi-dential	Commercial	Industry & Utilities	Public Facilities	Total
Kings River Basin							
Above Pine Flat Dam	0	0	0	25	33	1,777	1,835
Below Pine Flat Dam	6,790	56	26	68	34	28	212
Kaweah River Basin							
Above Terminus Dam	880	108	257	223	179	2,701	3,468
Below Terminus Dam	16,460	566	178	56	115	367	1,282
Tule River Basin							
Above Success Dam	1,520	158	297	150	373	3,669	4,647
Below Success Dam	24,800	961	0	0	287	291	1,539
Kern River Basin							
Above Isabella Dam	7,880	381	121	372	542	2,601	4,017
Below Isabella Dam	12,150	188	53	3	116	263	623
Caliente Creek Basin	11,680	671	68	75	117	198	1,129
Poso Creek Stream Group	13,860	618	5	0	99	576	1,298
Coalinga Stream Group	5,370	302	0	0	203	87	592
Sunflower Valley Streams	13,880	56	0	0	25	14	95
Tulare Lake Bed	26,560*	700	0	0	1	2	703
Total Tulare Lake Basin	141,830*	4,765	1,005	972	2,124	12,574	21,440

*Includes 14,720 acres flooded by diverted floodwaters, for which no damage was reported.

Courtesy Hammond's Studio, Porterville, California

Plates 16, 17, 18, and 19 show the operation of Isabella, Success, Terminus, and Pine Flat Reservoirs.

The total area flooded was 141,800 acres, most of which was agricultural land on the valley floor and grazing and pasture land in the upstream areas. Many towns on the valley floor were threatened by high water, but only nominal amounts of scattered urban flooding actually occurred. Kernville, in Kern County above Isabella Reservoir, was one of the hardest hit communities.

The Kern River tore out a bridge in the center of town and also washed out the State fish hatchery. Flood waters isolated the area and property damage was high. Six hundred residents of a logging camp forty miles north of Kernville were stranded. Hundreds of cattle were lost when they were stranded by water pouring over the grazing areas near low-lying areas of Lake Isabella.

The Kaweah River overflowed its banks above Terminus Reservoir isolating the communities of Mobile Camp and Mountain Home Camp. In the community of Springville upstream from Success Reservoir, the Tule River swept away houses and destroyed the community's water system. Residents along the river were evacuated. In the Porterville area, the National Guard helped evacuate some two hundred families from their homes. In the mountain and foothill areas, extensive damage occurred. Highways, bridges, public recreational facilities, cabins and summer homes were heavily damaged. Streambank erosion was extensive and large amounts of silt and debris were deposited on pasture and cropland, as well as in reservoirs.

On the valley floor, significant amounts of flooding occurred in the Tulare Lakebed and Buena Vista Lake, which are almost entirely devoted to agricultural uses.

Primary flood damage in Tulare Lake Basin is estimated at $21,440,000.

Three deaths were attributed to the flood. On the Tule River Indian Reservation, a 6-year old boy died from exposure after being isolated by high water and separated from his family. On the lower Kern River, a laborer attempting to clear debris from the river fell into the stream and was swept away. On the South Fork of the Kern River, a 22-year old girl died from exposure after she and a companion were isolated by floodwaters.

The Kings River, on the edge of the storm center, did not carry damaging flood flows. The peak flow into Pine Flat Reservoir was 91,000 cfs on December 6. Discharge from the reservoir was held to a minimum; the average daily release during the period December 3 to December 11 was 62 cfs. During this period, the reservoir gained 208,600 acre-feet in storage. On December 12, the 1,000,000 acre-feet capacity reservoir had 493,000 acre-feet in storage.

Bridges were destroyed--

Courtesy Hammond's Studio, Porterville, California

--and homes severely battered and damaged.

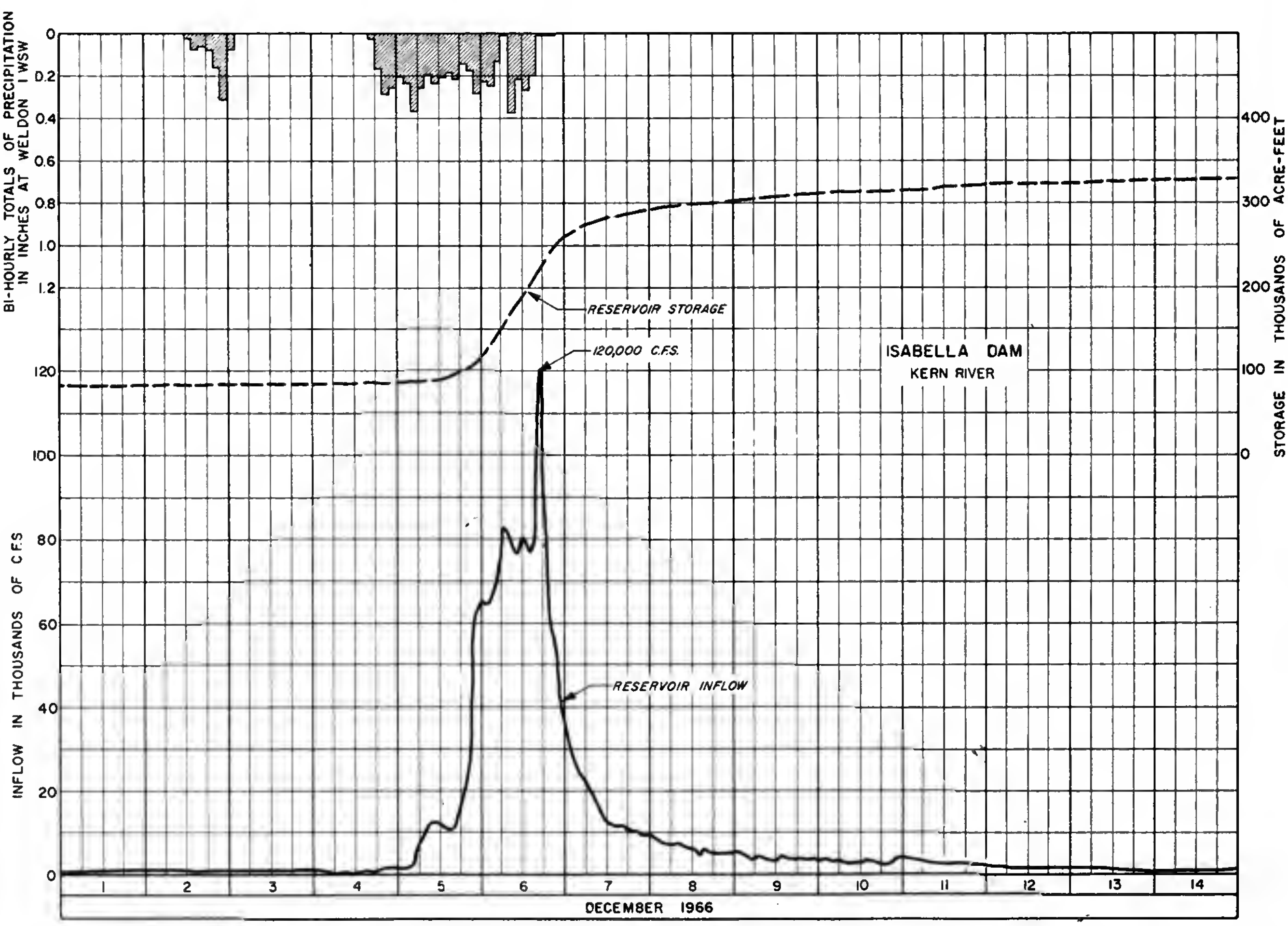
Courtesy Hammond's Studio, Porterville, California

RAINFALL TOTALS AT SELECTED PRECIPITATION STATIONS

PRECIPITATION STATION AND BASIN	OBSERVATION TIME	ELEVATION	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)
KERN RIVER BASIN						
WELDON 1SW	MID RECORDING RAIN GAGE	2680	DEC. 2-6	6.06	JAN. 22-30	1.91
JOHNSONDALE	8A	4680	DEC. 3-8	30.46	JAN. 21-31	5.86
GREENHORN MT. PK.	8A	6050	DEC. 2-7	23.44		
ISABELLA RES.	8A	2660	DEC. 2-7	11.49		

SELECTED PEAK RUNOFF EVENTS

STREAM GAGING STATION	DRAINAGE AREA (SQ. MILES)	PEAK STAGE (FEET)	PEAK DISCH. (C.F.S.)	RUNOFF PERIOD (INCLUSIVE)	RUNOFF VOLUME SFD	ACRE-FEET	INCHES
KERN RIVER NEAR QUAKING ASPEN	530	10.9		DEC. 1-14	16,590	32,848	1.16
SOUTH FORK KERN RIVER NEAR ONYX	530	12.0	28,700	DEC. 1-14	25,070	49,639	1.76
KERN RIVER NEAR KERNVILLE	1009	22.2	74,000	DEC. 1-14	86,573	171,414	3.19



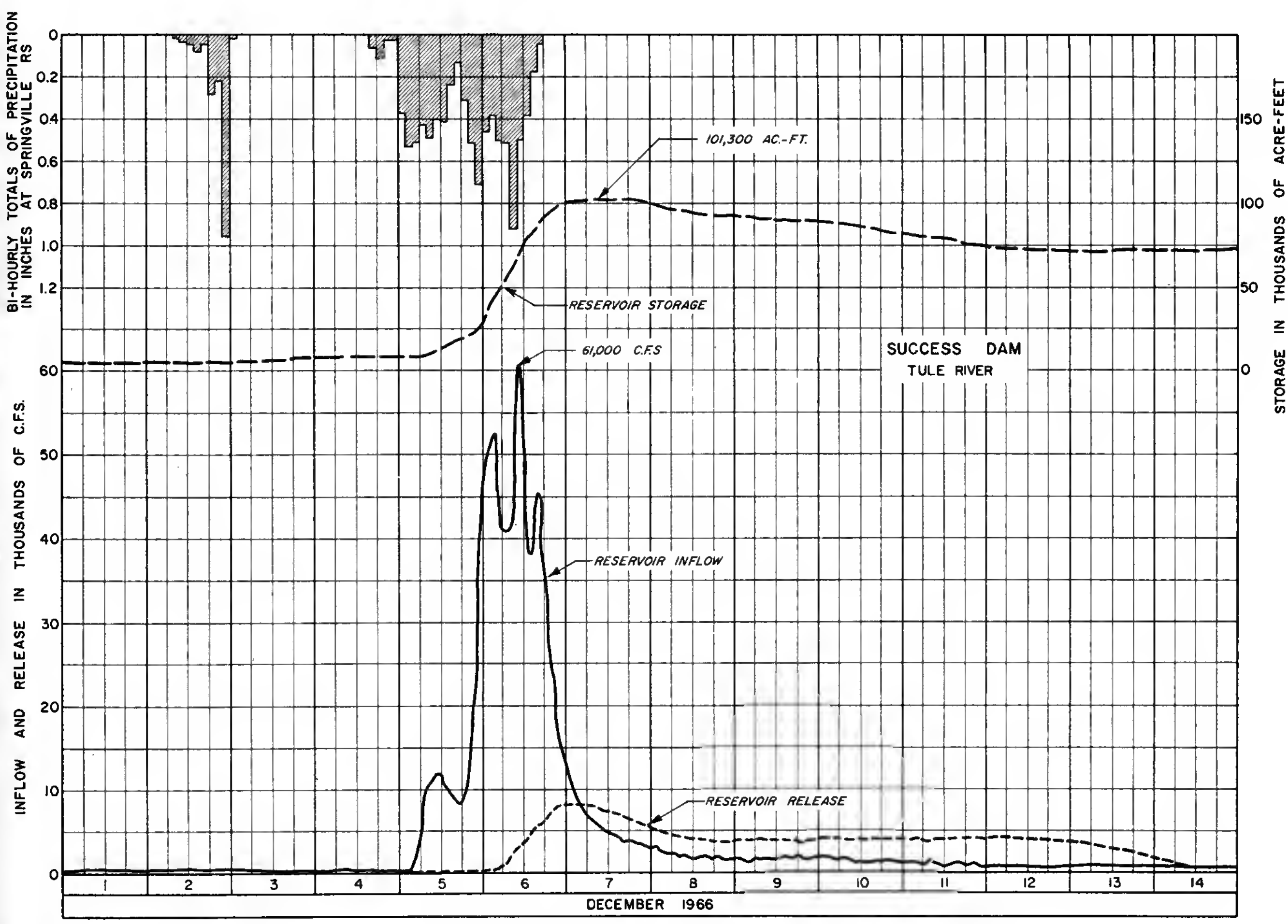
OPERATION OF ISABELLA DAM

RAINFALL TOTALS AT SELECTED PRECIPITATION STATIONS

PRECIPITATION STATION AND BASIN	OBSERVATION TIME	ELEVATION	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)
TULE RIVER BASIN						
SPRINGVILLE RANGER STA.	MID RECORDING RAIN GAGE	1050	DEC. 2-6	10.78	JAN. 20-31	3.04
PORTERVILLE	8A	393	DEC. 2-7	5.55	JAN. 21-31	1.92
SPRINGVILLE 7ENE	7A	1050	DEC. 2-8	19.47	JAN. 21-FEB. 2	5.08
CAMP NELSON	7A	4700	DEC. 2-7	29.20		

SELECTED PEAK RUNOFF EVENTS

STREAM GAGING STATION	DRAINAGE AREA (SQ. MILES)	PEAK STAGE (FEET)	PEAK DISCH. (C. F. S.)	RUNOFF PERIOD (INCLUSIVE)	RUNOFF VOLUME		
					SFD	ACRE-FEET	INCHES
SOUTH FORK TULE RIVER NEAR SUCCESS	109	12.6	14,300	DEC. 1-14	11,398	21,428	3.69
TULE RIVER NEAR SPRINGVILLE	225	19.7	49,600	DEC. 1-14	50,223	99,441	8.28



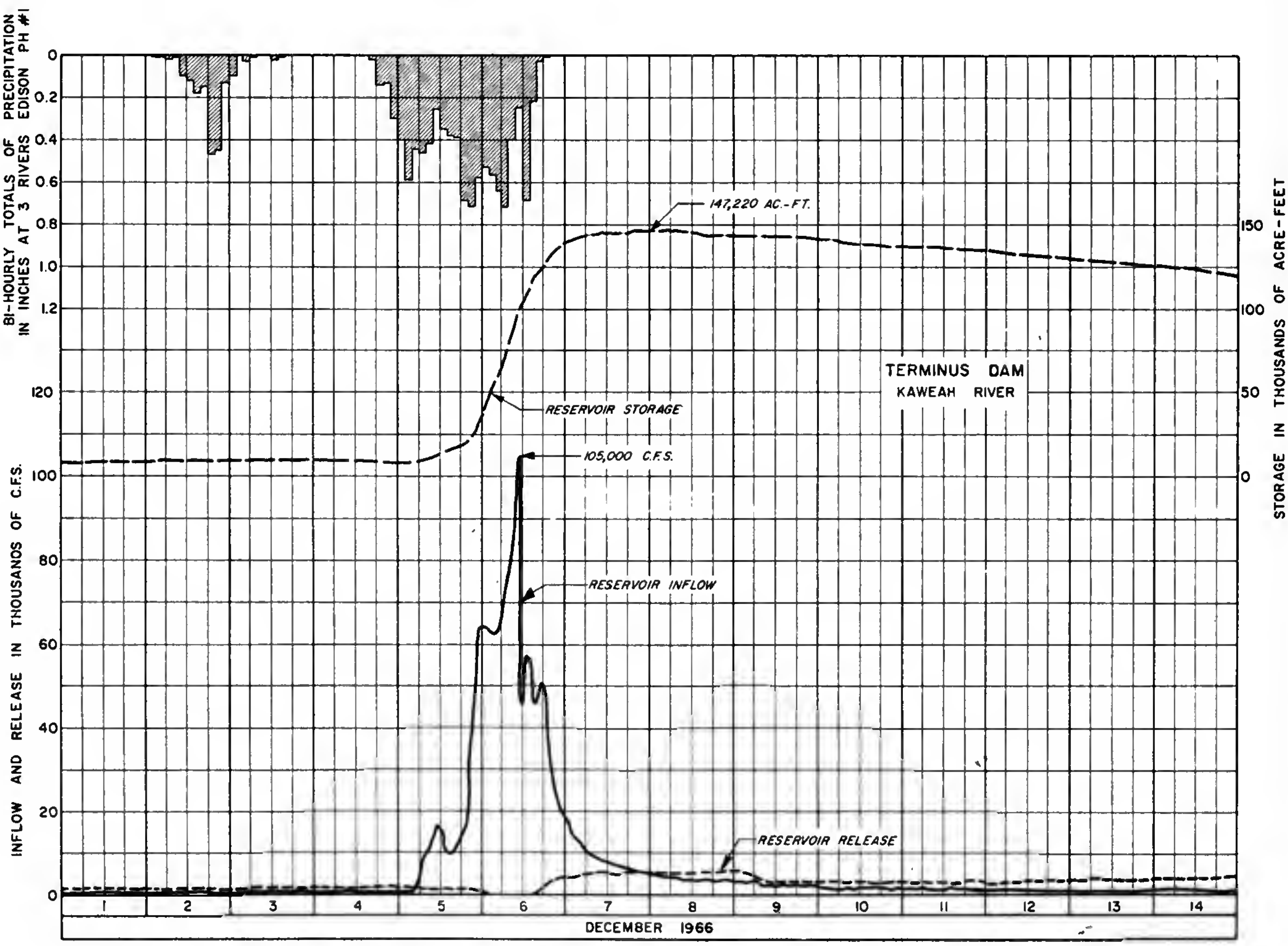
OPERATION OF SUCCESS DAM

RAINFALL TOTALS AT SELECTED PRECIPITATION STATIONS

PRECIPITATION STATION AND BASIN	OBSERVATION TIME	ELEVATION	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)
KAWEAH RIVER BASIN						
THREE RIVERS EDISON PH I	MID RECORDING RAIN GAGE	1140	DEC. 2-6	12.16	JAN. 20-31	4.00
MILO 5NE	MID RECORDING RAIN GAGE	3400	DEC. 2-7	23.25	JAN. 20-31	6.03
GIANT FOREST	8A	6412	DEC. 2-7	21.89	JAN. 21 - FEB. 1	11.07
ASH MTN	8A	1708	DEC. 2-8	15.53	JAN. 21-31	5.02

SELECTED PEAK RUNOFF EVENTS

STREAM GAGING STATION	DRAINAGE AREA (SQ. MILES)	PEAK STAGE (FEET)	PEAK DISCH. (C. F. S.)	RUNOFF PERIOD (INCLUSIVE)	RUNOFF VOLUME		
					SFD	ACRE-FEET	INCHES
SOUTH FORK KAWEAH RIVER AT THREE RIVERS	87	9.3	11,600	DEC. 1-14	12,590	24,928	5.36
MIDDLE FORK KAWEAH RIVER NEAR POTWISHA CAMP	102	17.7	23,300	DEC. 1-14	19,745	39,095	7.19
KAWEAH RIVER AT THREE RIVERS	418	19.0	73,000	DEC. 1-14	74,614	147,736	6.62



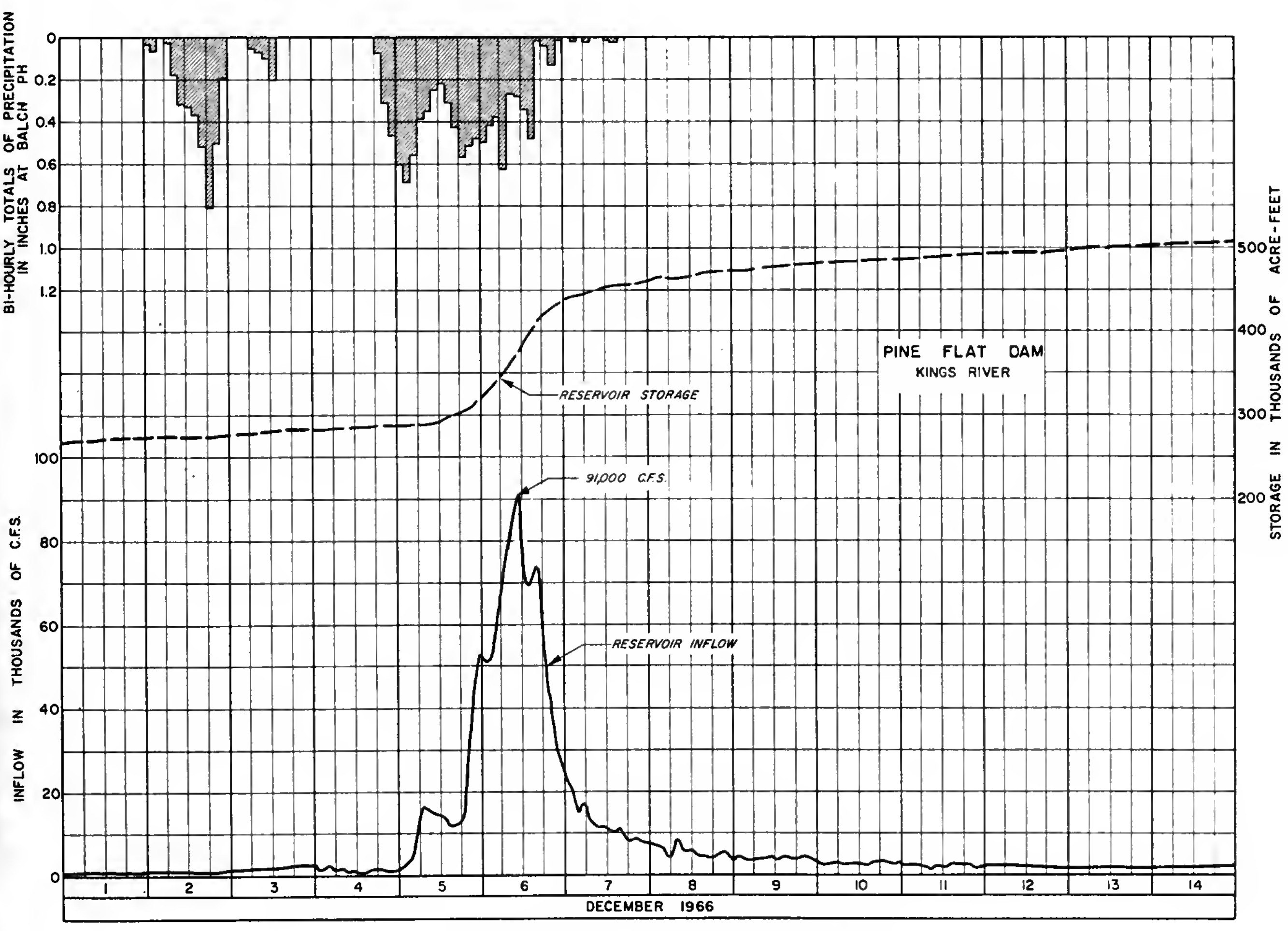
OPERATION OF TERMINUS DAM

RAINFALL TOTALS AT SELECTED PRECIPITATION STATIONS

PRECIPITATION STATION AND BASIN	OBSERVATION TIME	ELEVATION	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)	PRECIP. PERIOD (INCLUSIVE)	PRECIP. TOTAL (INCHES)
KINGS RIVER BASIN						
BALCH PH	4P	1020	DEC. 2-7	13.55	JAN. 21-FEB. 1	7.56
PIEDRA BLANCA GUARD STA.	MID	3065	DEC. 2-6	9.40	JAN. 21-31	5.95
GRANT GROVE	BA	6600	DEC. 2-7	23.04	JAN. 21-31	8.55

SELECTED PEAK RUNOFF EVENTS

STREAM GAGING STATION	DRAINAGE AREA (SQ. MILES)	PEAK STAGE (FEET)	PEAK DISCH. (C. F. S.)	RUNOFF PERIOD (INCLUSIVE)	RUNOFF VOLUME SFD	RUNOFF VOLUME ACRE-FEET	RUNOFF VOLUME INCHES
KINGS RIVER ABOVE NORTH FORK NEAR TRIMMER	952	14.6	41,000	DEC. 1-14	69,403	137,418	2.71
KINGS RIVER BELOW NORTH FORK	1342	19.67	60,900	DEC. 1-14	97,800	193,644	2.70
KINGS RIVER BELOW NORTH FORK	1342	19.8	63,000	DEC. 1-14	91,077	180,332	2.58



OPERATION OF PINE FLAT DAM

SNOWMELT RUNOFF

The mountain snowpack usually reaches maximum accumulation about April 1. Streamflow forecasts prepared on that date this year warned all agencies responsible for reservoir operations to plan for high snowmelt flows. The April-July runoff forecast for the San Joaquin Valley Basins varied from 113 percent of normal for the Merced River to 162 percent for the Kern River. However, cold storms during April caused temperatures to remain below normal. Runoff during April was relatively low, delaying the major snowmelt period one month behind its usual beginning date. The water content of the Southern Sierra basins increased about 35 to 40 percent during April compared to a normal depletion of 30 percent.

Reservoir storage on April 1 was above average in all areas of the State except the North Coastal area. One hundred twenty-two major reservoirs were storing 17,167,000 acre-feet, or 120 percent of the 10-year average for this date. Stored water in the San Joaquin Valley Basins reached 160 percent of average. During the month of April, many reservoirs became encroached into their allowable flood control space. In the latter part of the month, reservoir operators began making outflow releases equal to or in excess of inflows to begin conserving storage space for the above-normal May-July forecasted flows.

New records were established May 1 as the snow water content exceeded all previous records for that date. A comprehensive May 1 snow survey confirmed the magnitude and runoff potential of the unusually heavy late-season snowpack. It was generally acknowledged that flooding problems might occur if an unusually hot temperature regime developed in May or early June.

The area of concern for high runoff flows was predominantly the San Joaquin Valley. Although the Upper Sacramento, Feather, Yuba and American River Basins also experienced an above-normal water year, it was felt the Sacramento and American river flood control projects would easily contain the snowmelt flows without danger of flooding.

On May 2, Governor Reagan signed an emergency declaration. The declaration enabled money to be made available to the Department of Water Resources for flood emergency operations in the San Joaquin Valley.

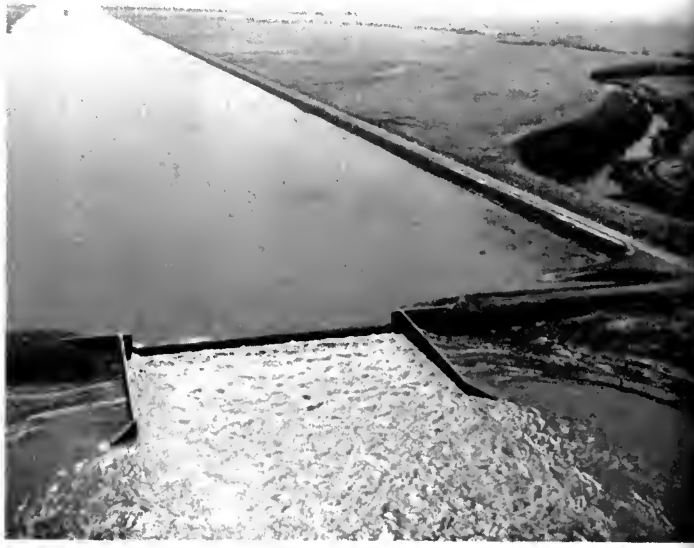
It was anticipated that the newly completed Lower San Joaquin Valley Flood Control Project, built by the Department of Water Resources, would receive a critical test of design capacity flows during the snowmelt period. The Department moved men and heavy equipment to strategic locations in the San Joaquin Valley area. Levee patrols were established to supplement local maintenance agencies and to provide technical assistance if required.

On May 10, Governor Reagan, along with representatives from the Legislature, Corps of Engineeers, Bureau of Reclamation, and Department of Water Resources, made a personal inspection of the San Joaquin Valley flood control project, and flooded areas.

Forecasts of runoff were closely verified and updated through May. As summer weather patterns returned, the late snow retention posed a hazard because of both the great amount of water stored in the snowpack and the increasing probability of a continued warm period.

Temperatures rose during the second week of May and runoff increased until maximum flows were generally reached

Snowmelt runoff in the San Joaquin River being diverted into the Chowchilla Canal Bypass.



Drop structures in the project provide channel stabilization by maintaining velocities below the scouring point.

The 14-bay Mariposa Bypass control structure discharging flow from the Eastside Bypass into the Mariposa Bypass.

Excess flows being diverted through the six-bay radial-gated Eastside Bypass control structure.

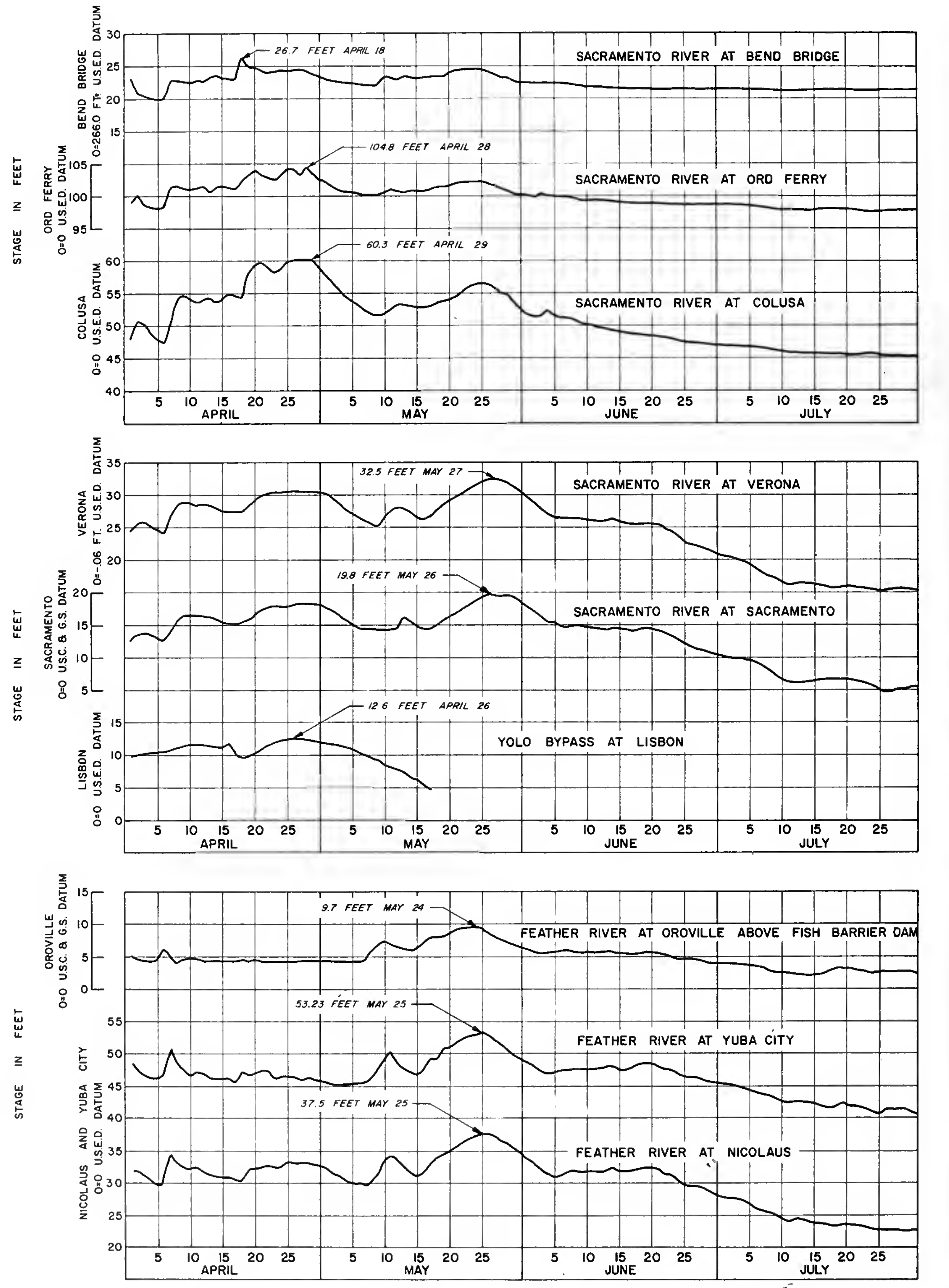
Table 13: Snowmelt Runoff Data

Area, Stream and Station	April 1, 1967 - July 31, 1967			
	Measured Flow (Acre-Feet)	Unimpaired Runoff		
		Total For Period (Acre-Feet)	50-year Average (Acre-Feet)	In % of Average
Sacramento Valley Area				
Sacramento River, Inflow to Shasta	2,760,100	2,760,100	1,787,900	154
Sacramento River, near Red Bluff	4,102,400	3,896,700	2,492,100	156
Feather River near Oroville	2,563,700	3,041,500	1,942,400	157
Yuba River at Smartville	1,381,900	1,734,400	1,126,000	154
American River, Inflow to Folsom	1,693,600	2,301,600	1,386,800	166
Cosumnes River at Michigan Bar	327,900	333,200	131,000	254
Mokelumne River, Inflow to Pardee	663,400	831,400	479,800	173
San Joaquin Valley Area				
Stanislaus River, Inflow to Melones	1,215,700	1,340,100	737,300	182
Tuolumne River, Inflow to Don Pedro	1,531,800	2,175,400	1,212,900	179
Merced River, Inflow to Exchequer	945,700	1,232,300	621,800	198
Kings River, Inflow to Pine Flat	1,935,600	2,277,300	1,174,900	194
Kaweah River, Inflow to Terminus	475,200	609,500	263,400	231
Tule River, Inflow to Success	115,300	164,000	56,400	291
Kern River, near Bakersfield	1,401,000	924,000	432,700	214
San Joaquin River, Inflow to Millerton	1,133,500	2,327,200	1,215,100	191

near the end of the month. By the end of May, cooler temperatures had again set in, and streamflows decreased.

Changes were made in runoff forecasts of snowmelt streams to reflect the below-average temperatures that occurred during the latter part of May. The low temperatures kept snowmelt runoff from reaching peaks as high as expected.

For the first time, extensive June snow surveys were made throughout the State. The water contents at many high elevation snow survey courses exceeded the normal expected in April (usually the time maximum accumulation occurs for the season) and confirmed the fact that the snowpack in the San Joaquin Valley watersheds could cause new peak flows. By early July, these peak flows had occurred and water agencies finally were able to turn their attention from water disposal to water use problems.



HYDROGRAPHS OF SACRAMENTO RIVER, YOLO BYPASS AND FEATHER RIVER

Sacramento River

The hydrographs of inflow and releases for Shasta Lake are shown in Plate 22, page 49. The peak mean daily inflow resulting from snowmelt runoff during the April-July period was 24,100 cfs on April 6, and the maximum mean daily release from Shasta was 19,100 cfs on May 24. Shasta's storage reached a maximum of 4,550,300 acre-feet on May 19, of which 50,300 acre-feet was retained as a surcharge by the spillway gates.

Releases from Keswick to the downstream river channel reached a maximum of 19,100 cfs on May 20. Since the Sacramento Flood Control Project was designed to handle considerably higher flows, the downstream channel capacities were large enough to easily pass the snowmelt runoff. Only minor, although quite unseasonable, overflow occurred at Tisdale and Fremont Weirs during late May. A peak overflow of about 400 cfs was experienced at Tisdale Weir on April 27, and a peak overflow of about 2,600 cfs occurred May 27 at Fremont Weir.

The major contributing factor that caused overflow at Fremont Weir was the snowmelt runoff from the Feather River Basin. This flow reached a maximum of 28,100 cfs at Oroville on May 23 and reached Fremont Weir at about the same time the Sacramento River was peaking from its snowmelt runoff. Crops planted in the overflow lands in the Sutter and Yolo Bypasses prior to the peak flows from snowmelt experienced some flooding. Hydrographs of the flow at several points along the Sacramento River are shown on Plate 20.

Yuba River

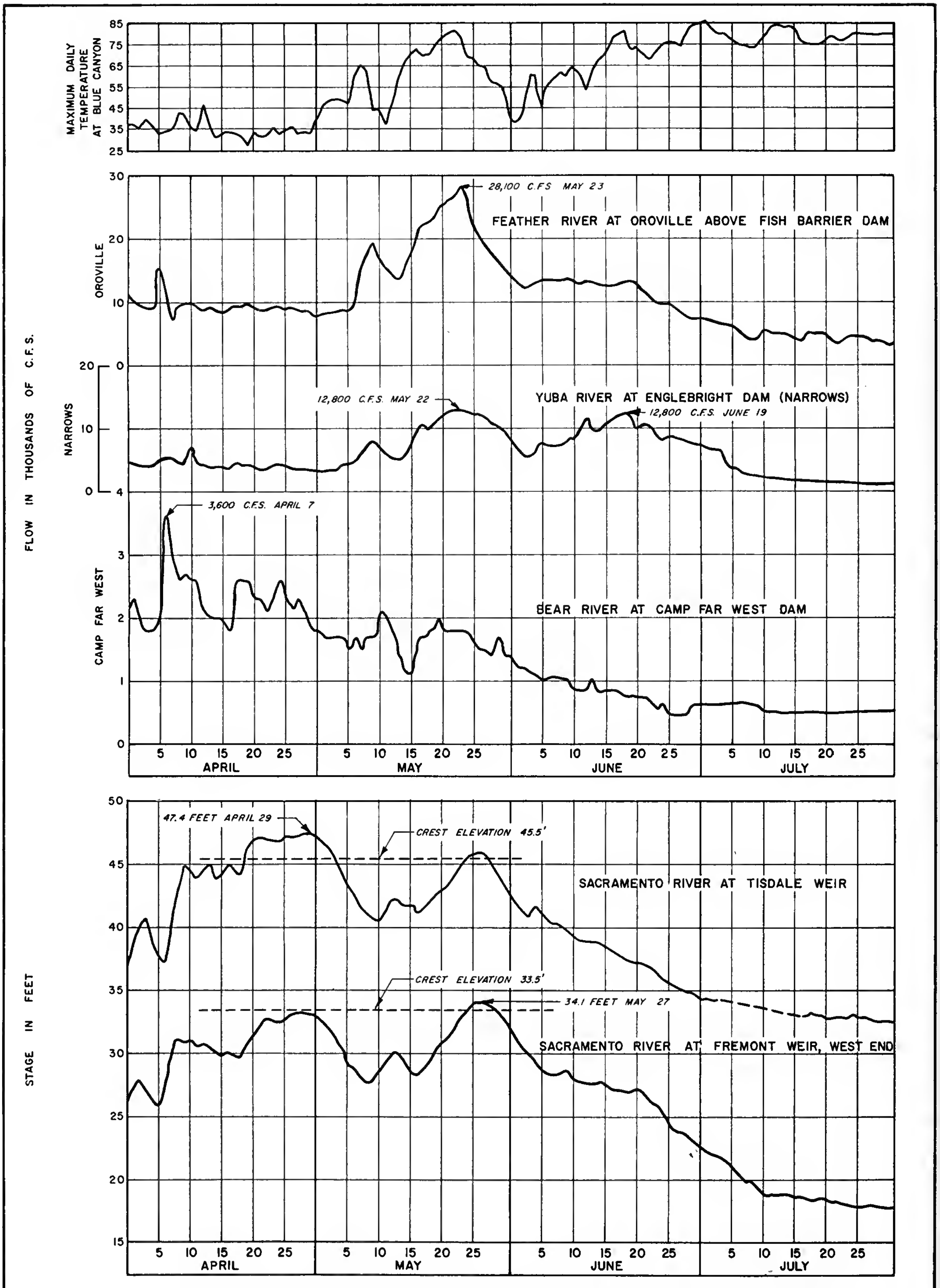
The May 1 forecast of April-July runoff in the Yuba River Basin was 1,700,000 acre-feet, or 151 percent of average; the actual unimpaired runoff was 1,734,400 cfs.

Englebright Dam, on the main stem of the Yuba River near Smartville, had a maximum discharge of 12,800 cfs on May 22. This comparatively moderate flow caused no damage as the channel capacity is great enough to carry flows slightly in excess of 80,000 cfs.

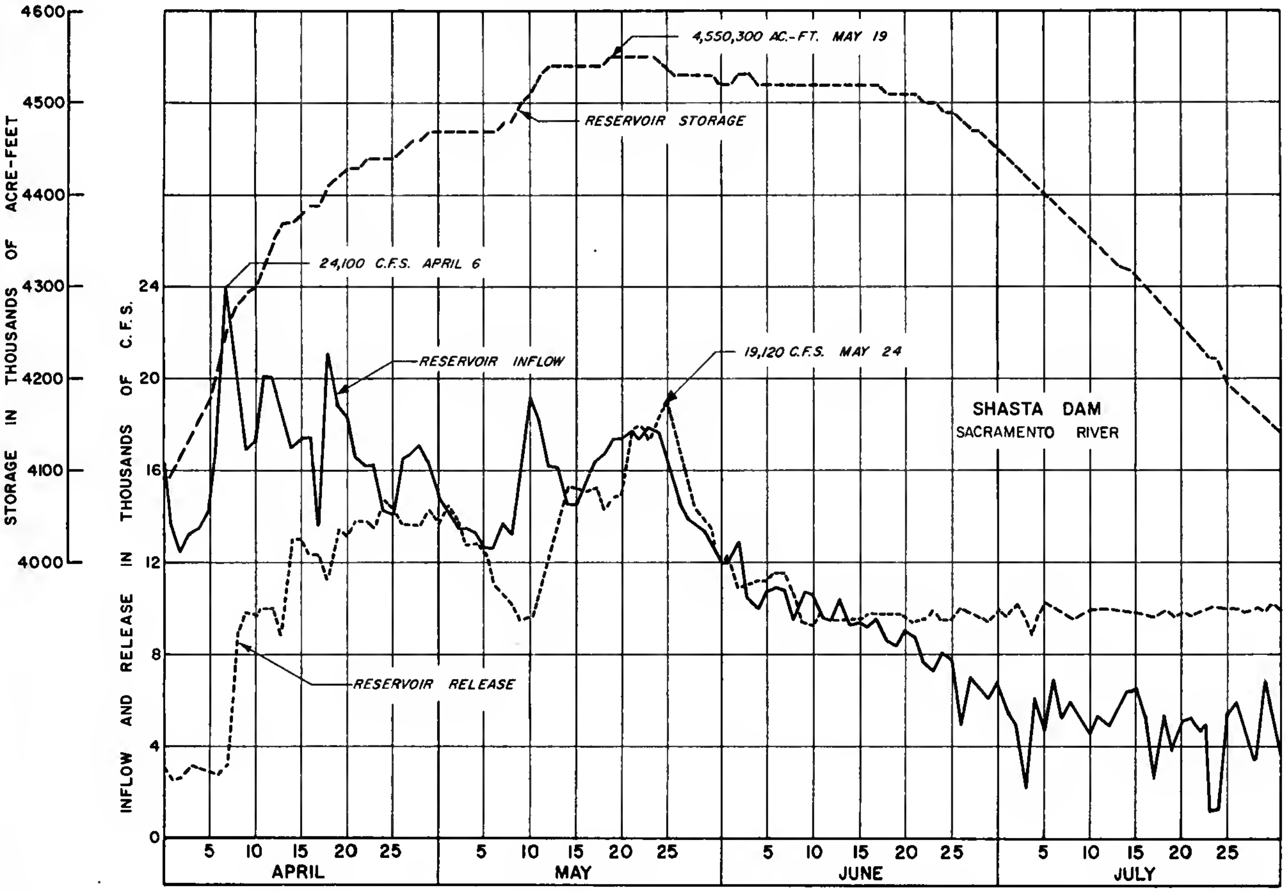
Although no flood problems occurred along the Yuba River, its peak flows combined with the peak flows of the Feather River contributed to the overflow that was experienced at Fremont Weir on the Sacramento River on May 24 through May 29.

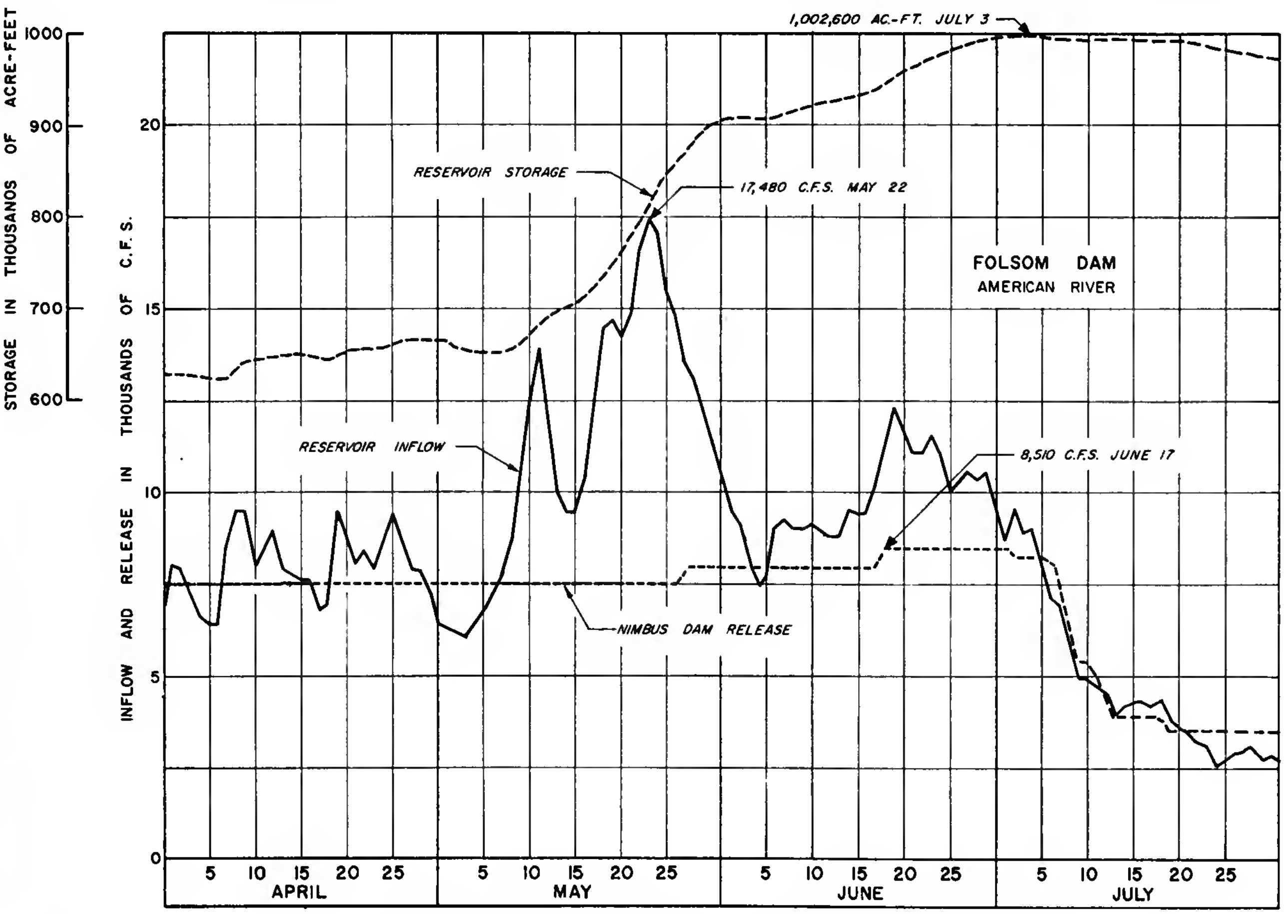
Feather River

In the Feather River Basin, the snowpack accumulated through the winter season normally melts early in the spring runoff period. However, this year the temperatures did not climb to well above normal until about May 13 and then continued through May 24. The snowpack finally began melting rapidly during this period and produced a peak flow of about 28,100 cfs at the Oroville Fish Barrier Gage below Oroville Reservoir on May 23. Although the downstream channel below Oroville Dam is able to handle much higher flows, some agricultural land located in the flood plane experienced relatively moderate flooding. Hydrographs of flow at several locations on the Feather River during the April-July period are shown on Plate 20 and Plate 21.

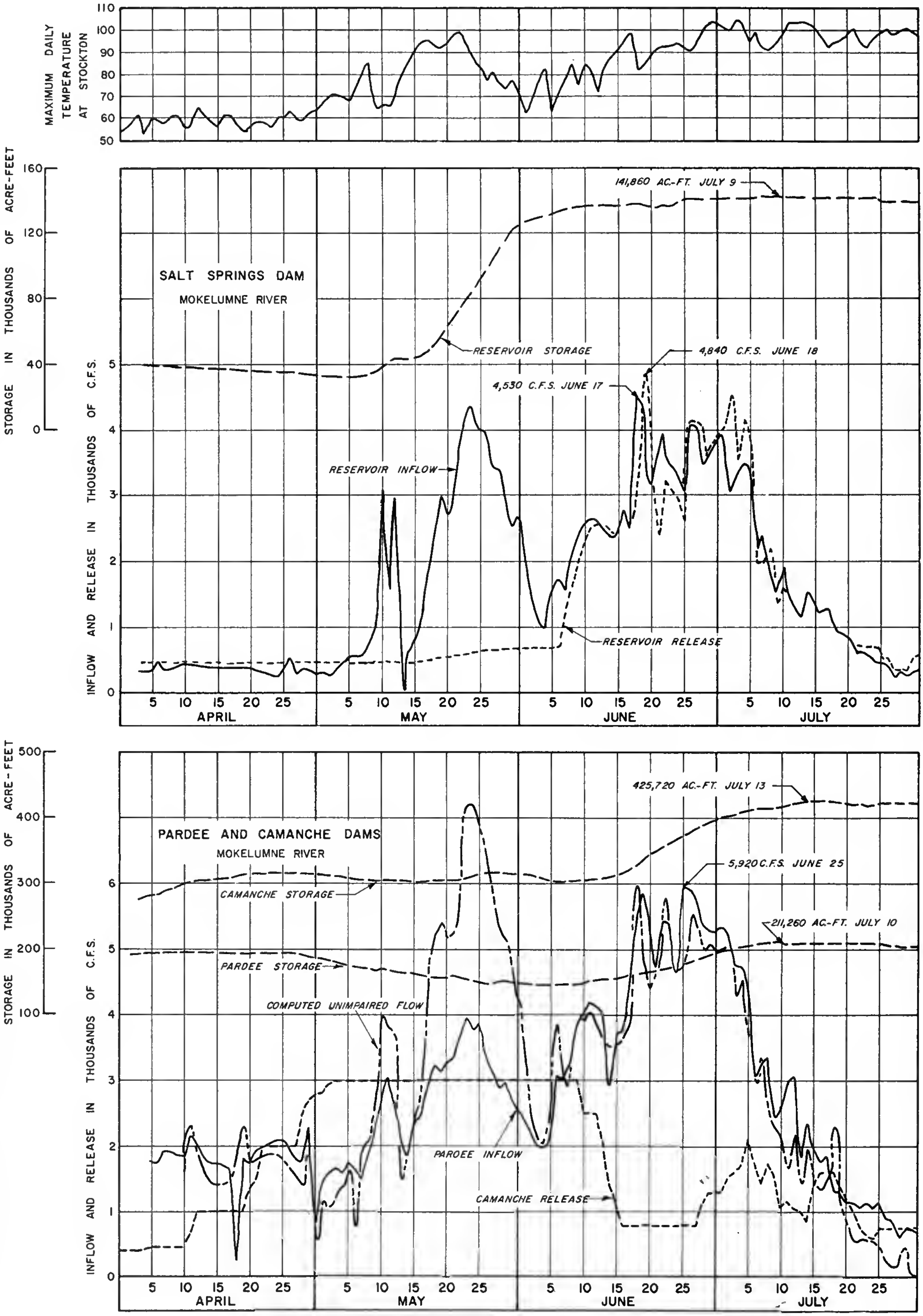


HYDROGRAPHS OF FEATHER, YUBA, BEAR AND SACRAMENTO RIVERS





OPERATION OF SHASTA AND FOLSOM DAMS



OPERATION OF SALT SPRINGS, PARDEE AND CAMANCHE DAMS

American River

There is a total reservoir storage capacity of 1,796,000 acre-feet in the American River Basin. On April 1, there was 706,000 acre-feet of available storage to retain the spring runoff. Folsom Dam, which is located at the extreme lower portion of the American River Basin, has a maximum storage capacity of 1,010,000 acre-feet, and provides the major flood control regulation for the river.

Even though the April 1 water supply forecast prepared by the Department of Water Resources called for 1,680,000 acre-feet of unimpaired runoff for the April-July period, sufficient regulation control existed to handle the snowmelt runoff without any difficulties. On May 1, the Department revised its April-July forecast to 2,300,000 acre-feet of unimpaired runoff. During April, 430,000 acre-feet of runoff occurred, leaving 1,870,000 acre-feet of runoff, or 205 percent of average, to occur from May 1 through July 31.

The maximum mean daily inflow to Folsom Dam was 17,480 cfs on May 22. However, the maximum release from Folsom during the snowmelt period was 8,510 cfs, which is a minor flow compared with the downstream channel capacity of 115,000 cfs. Folsom Dam gained more than 342,000 acre-feet of storage during the spring runoff period from May 8 through June 30. Shown in Plate 22, page 49, are the hydrographs of inflow to Folsom Dam and release from Nimbus Dam during the April-July period.

Cosumnes River

The Cosumnes River Basin is a low-elevation basin surrounded by the American and Mokelumne River Basins. Normally, the Cosumnes River Basin receives very little snowmelt runoff; this year, however, was an exception. The excessive amount of snowfall that was deposited at low altitudes in April eventually resulted in an April-July unimpaired snowmelt runoff of about 330,000 acre-feet or 254 percent of average.

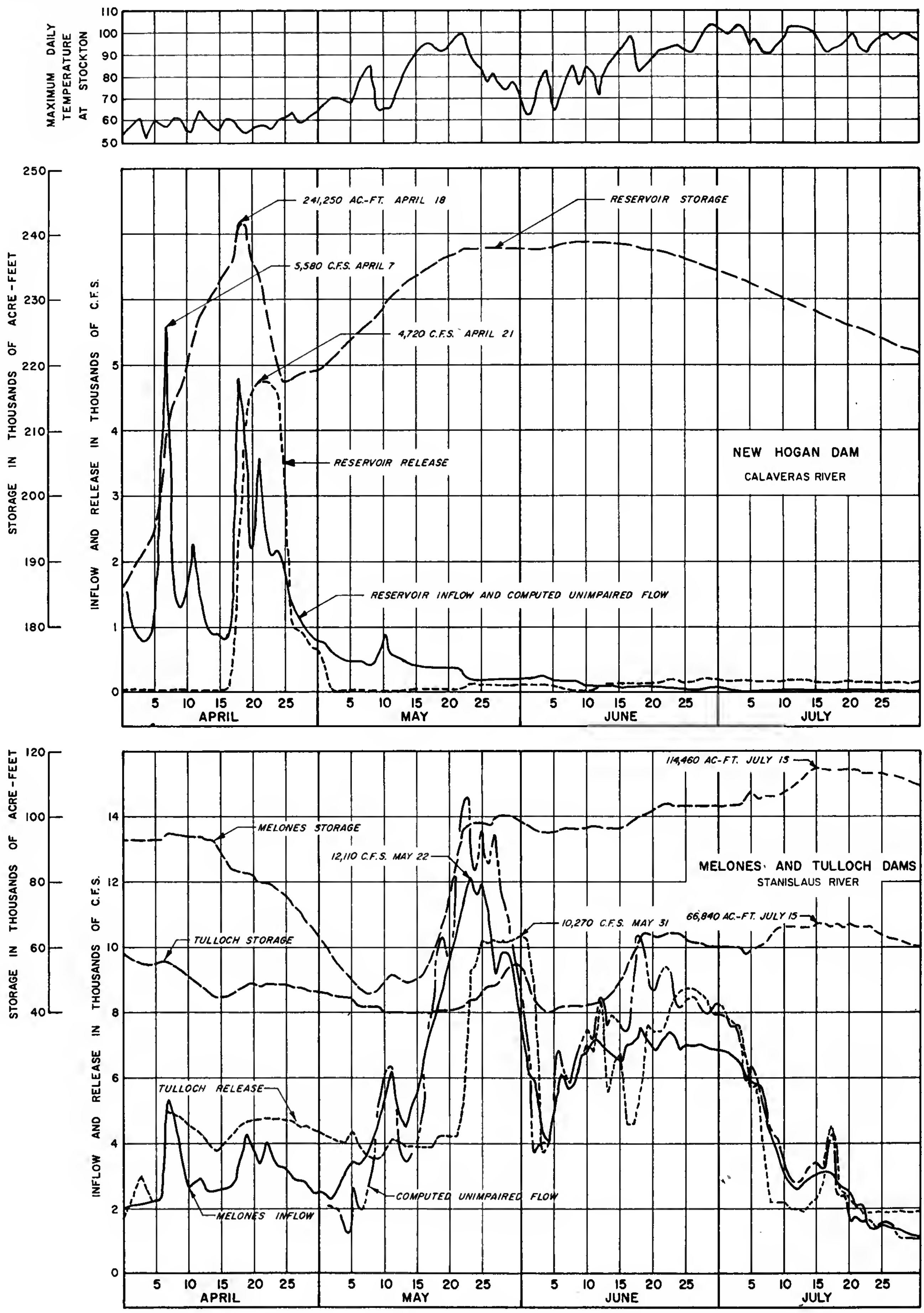
At Michigan Bar, the danger stage for flooding is 7 feet. The peak stage this spring occurred May 24 and reached 6.6 feet. The maximum stage of record, 14.6 feet, occurred December 23, 1955, but was the result of a rain storm.

Flow from the Cosumnes River can contribute to high-water problems in the Delta Area below the confluence with the San Joaquin River. This snowmelt season, however, no flooding problems were reported in the Delta area.

Mokelumne River and Calaveras River

The North, Middle, and South Forks of the Mokelumne River provide the inflow to Pardee Dam. Camanche Dam is located immediately downstream from Pardee Dam, and, for all practical purposes, they act as one reservoir with the discharge from Pardee being almost the total inflow to Camanche. Their maximum reservoir storage capacities are 210,000 acre-feet in Pardee and 431,500 acre-feet in Camanche. Salt Springs Reservoir, located on the North Fork of the Mokelumne River and the uppermost reservoir on the stream system, has a maximum reservoir storage capacity of 139,400 acre-feet.

During April, with very little snowmelt occurring, storage in the three



OPERATION OF NEW HOGAN, MELONES AND TULLOCH DAMS

reservoirs remained rather constant. In May, Salt Springs Reservoir increased storage from 33,000 acre-feet to 127,000 acre-feet, and the discharge ranged from 450 cfs to 675 cfs. On June 5, when the reservoir approached its maximum capacity, releases were increased rapidly and on June 13 they reached a maximum of 4,840 cfs. Following this peak discharge, outflow was regulated approximately equal to inflow through July.

During the month of April, discharges from Camanche Dam increased from 400 cfs to 2,800 cfs. Early in May, the discharges reached a maximum of 3,000 cfs and remained as such into June; then they were cut back to 800 cfs to allow the inflows to fill both Pardee and Camanche reservoirs to their capacities. The nondamaging downstream channel capacity below Camanche Dam is about 5,000 cfs.

On the Calaveras River, New Hogan Reservoir serves to control the snowmelt flows, which are usually not too significant because the basin is rather low in elevation. The maximum reservoir storage space in New Hogan is 325,000 acre-feet, which was adequate to retain the snowmelt flows. In Plate 24 page 52, are shown the reservoir operation for New Hogan and the inflow hydrographs to the reservoir.

Stanislaus River

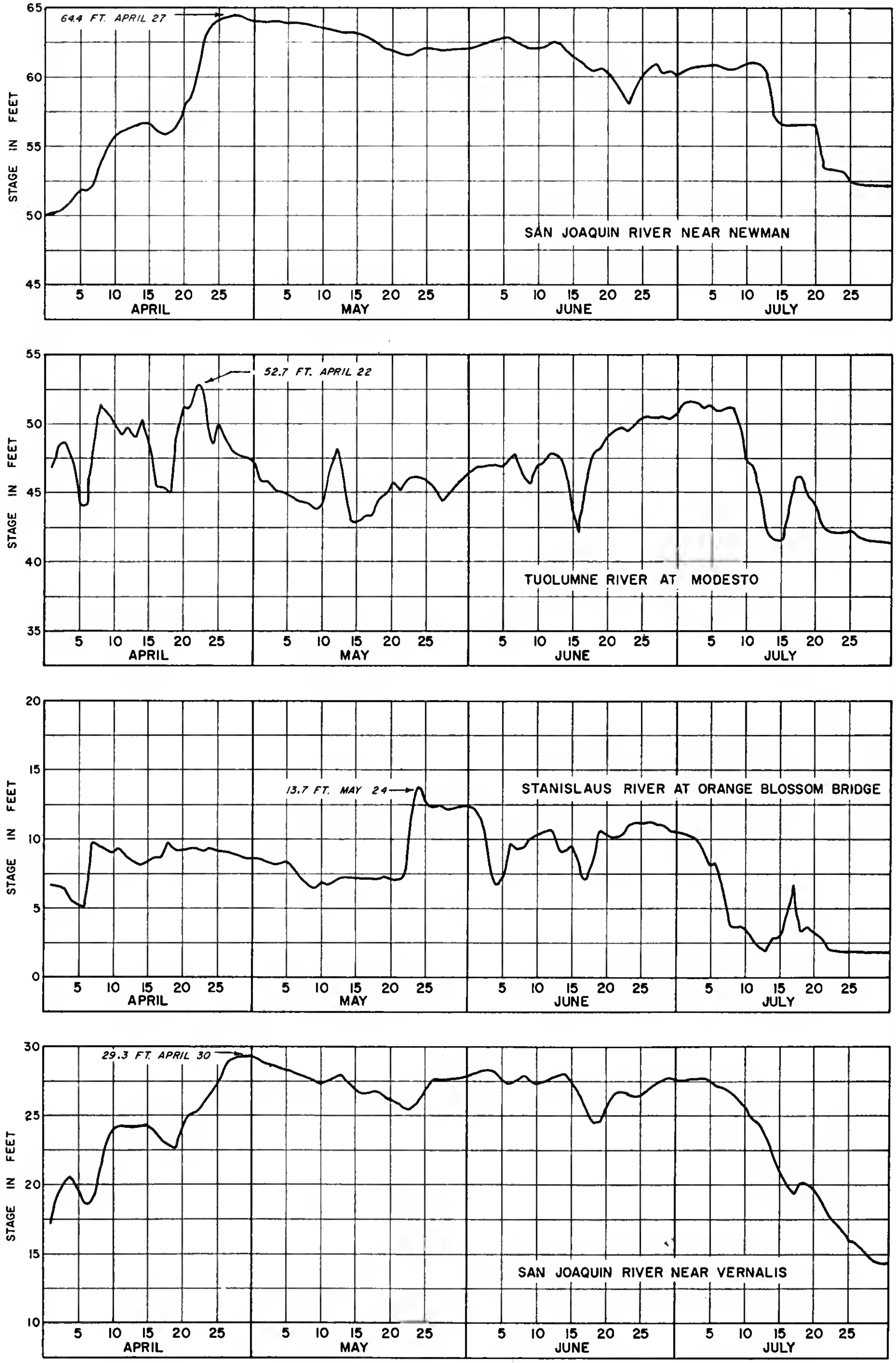
There are four major reservoirs in the Stanislaus River Basin--Donnells, Beardsley, Melones, and Tulloch--having a combined storage capacity of 343,800 acre-feet. These reservoirs were built principally for the generation of hydroelectric power and downstream irrigation, but not flood control. The ability to release water at each of these structures is extremely limited and as a result there is very little capability to adjust reservoir releases to rates of inflow. Thus, uncontrolled spill occurs at each reservoir when the inflow exceeds the maximum rate of discharge and the available reservoir storage is filled.

Donnells Reservoir, located on the middle fork of the Stanislaus River, and the uppermost reservoir on the stream system, has a maximum capacity of 64,500 acre-feet and a spillway crest storage of 53,300 acre-feet. When the water surface is below the spillway lip, releases are limited to about 400 cfs from a discharge valve and about 700 cfs through the powerhouse.

Beardsley Dam is located below Donnells Reservoir on the middle fork of the Stanislaus River. It has a maximum storage capacity of 98,300 acre-feet and a crest storage of 77,800 acre-feet. The maximum release that can be made when the water level is below the spillway crest is 650 cfs.

Melones Dam is located well below the confluence of the south fork with the main branch of the Stanislaus River. Virtually all of the snowmelt in this basin, except that which is retained in upper reservoirs, flows into Melones Reservoir. It has a maximum storage capacity of 112,600 acre-feet and a spillway crest storage of 90,700 acre-feet. Below the spillway lip, the maximum release capacity is 5,600 cfs.

Tulloch Dam is located below Melones and has a maximum storage capacity of 68,400 acre-feet. The maximum release below the spillway crest storage of 37,600 acre-feet is about 1,700 cfs through the powerhouse. It is not until the water level in Tulloch



HYDROGRAPHS OF SAN JOAQUIN, TUOLUMNE AND STANISLAUS RIVERS

Reservoir exceeds the spillway crest elevation that the outflow from the basin as a whole can exceed 1,700 cfs, or 3,400 acre-feet per day. The outflow from Tulloch, when the water level is above the spillway crest, is then dependent on the amount of head available.

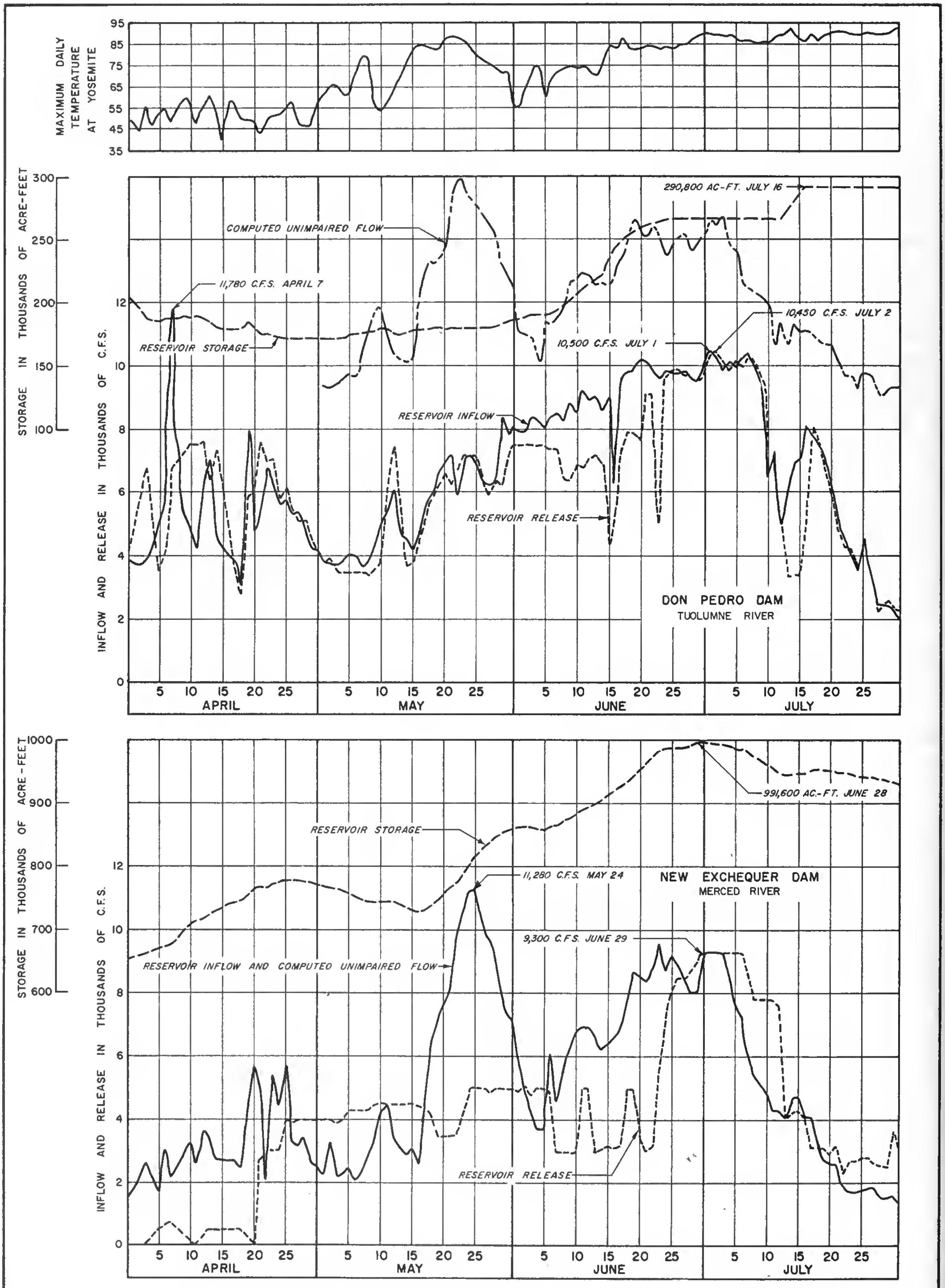
On April 1, the Department of Water Resources forecast an April-July unimpaired snowmelt runoff of 880,000 acre-feet for the Stanislaus River Basin. At that time, the total available reservoir space in the basin was 107,000 acre-feet. During April, about 183,000 acre-feet of runoff occurred. A hydrograph of April-July unimpaired runoff and the operation of Melones and Tulloch reservoirs are shown in Plate 24, page 52. The April runoff was 10 percent below normal due to the cool, stormy weather. On May 1, the forecasted April-July unimpaired runoff was revised upward to 1,230,000 acre-feet due to April precipitation. Thus, about 1,050,000 acre-feet of unimpaired snowmelt runoff was forecast for the remaining May-July period. The total available reservoir storage in the basin on May 1 was about 141,000 acre-feet.

As temperatures increased early in May, the snowpack began to reach threshold density and the mean daily flow increased from about 2,000 cfs on May 6 to about 6,200 cfs on May 11. The temperatures increased sharply from May 12 to May 17, and the flow also increased sharply. The temperature remained high for several days, causing the mean daily outflow from Tulloch Dam to reach about 10,270 cfs on May 31. The resulting downstream hydrograph at Orange Blossom is shown in Plate 25, page 54. From May 16 to May 25, Donnells Reservoir storage increased nearly 49,000 acre-feet. On May 25, there was only about 27,000 acre-feet of available storage space remaining in the basin. The peak runoff during this period reached about 34,000 acre-feet on May 27. If the temperature had continued high for a few more days, all the remaining basin reservoir storage would have been filled and the Stanislaus River would have been flowing without any reservoir control.

Had this unregulated flow occurred, it would undoubtedly have caused extensive agricultural flooding downstream. Fortunately, on May 24, a cooling trend developed and the mean daily flows began to slacken. With below-normal temperatures occurring through the first 14 days of June, the snowmelt rate remained at moderately low flows. The snowpack became sufficiently depleted so that its potential to produce further high flows was reduced. The peak mean daily flow during June was about 10,000 cfs on June 18. By the first of July, the snowpack had lost its potential to produce increased flows and the river began to recede even though the temperature remained above normal. There was little flooding along the Stanislaus River during the snowmelt period, although these flows contributed to local seepage problems below the confluence with the San Joaquin River. The April-July unimpaired runoff for the Stanislaus River Basin was 1,340,000 or 182 percent of average.

Tuolumne River

The April 1, 1967 Water Conditions bulletin, prepared by the Department of Water Resources, forecast an April-July unimpaired runoff of 1,425,000 acre-feet for the Tuolumne River Basin. Due to April's stormy weather conditions,



OPERATION OF DON PEDRO AND NEW EXCHEQUER DAMS

this forecast was revised on May 1 to 2,060,000 acre-feet, or 170 percent of average. During April, 300,000 acre-feet of runoff occurred leaving a May-July forecast of 1,760,000 acre-feet of runoff. There is a combined total reservoir storage capacity of 1,025,000 acre-feet in the basin, of which 578,000 acre-feet was available on April 1.

The three major dams in the basin, Cherry Valley, Hetch Hetchy, and Don Pedro, have adequate outlet facilities to regulate their storage. These reservoirs were operated to maintain sufficient flood reservation space for the peak flows from the snowmelt runoff. Releases from Don Pedro reached a peak mean daily discharge of about 7,500 cfs during May and about 10,450 cfs during the last few days of June and through the first ten days of July. The peak mean daily unimpaired flow that occurred in the basin was estimated to be about 16,000 cfs on May 23. Hydrographs of the Tuolumne River Basin full natural flows and Don Pedro reservoir inflow and outflow are shown in Plate 26, page 56.

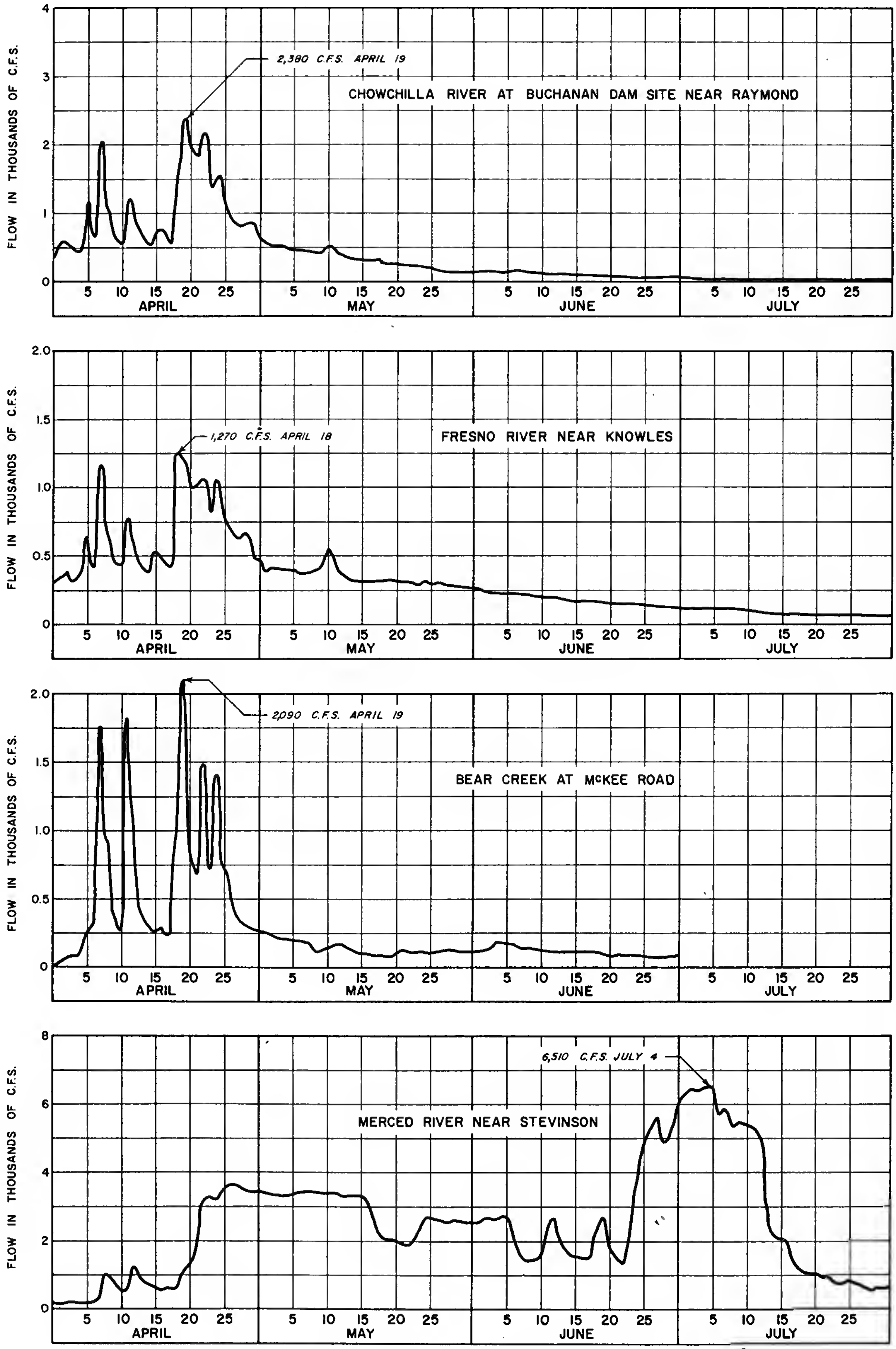
There is a diversion dam below Don Pedro at LaGrange, which diverts up to 3,200 cfs from the river for irrigation use. The maximum mean daily flow in the river channel below LaGrange was about 7,200 cfs on July 2. The channel capacity of the river below LaGrange is 9,000 cfs. With the prudent operation of the reservoirs, and the cool temperature regimes at the end of May and first of June, the snowmelt runoff in the Tuolumne River Basin did not cause any flood problems. The downstream hydrograph of flow for the Tuolumne River at Modesto during the period April-July is shown on Plate 25, page 54.

Merced River

There are two dams in the Merced River Basin: New Exchequer, with a maximum storage capacity of 1,026,000 acre-feet, and McSwain, with a maximum storage capacity of 9,480 acre-feet. The maximum release capacity of New Exchequer Dam with water elevation below the spillway is 9,300 cfs via a cone dispersion valve located in a 9-foot diameter penstock bypass tunnel, and 3,100 cfs through the powerhouse penstock. McSwain, which is a diversion dam below New Exchequer, diverts up to about 2,000 cfs of flow from the river for irrigation use. The channel capacity of the river below McSwain is about 6,000 cfs. With the sufficient storage and release capacities of New Exchequer, the snowmelt runoff was not expected to cause any problems. Releases were increased to about 4,000 cfs during the last week of April to provide increased storage space during the snowmelt period.

Beginning on May 12, the temperature in the Merced River Basin increased rapidly to above normal and remained there for several days. The mean daily inflows into New Exchequer increased from 2,600 cfs on May 16 to a peak mean daily flow of 11,280 cfs on May 25. New Exchequer's storage increased from about 730,000 acre-feet on May 16 to about 860,000 acre-feet on May 31. Releases were increased to a mean daily outflow of 5,000 cfs on May 24 and remained near that level until June 6, when releases were cut to 300 cfs during weekdays to allow for clearing work on a downstream channel obstruction that was causing erosion problems.

The storage had increase continuously from 859,000 acre-feet on June 5 to 991,600 acre-feet on June 28. Leakage through the dam structure, a problem that had existed since the construction of



HYDROGRAPHS OF CHOWCHILLA RIVER, FRESNO RIVER, BEAR CREEK AND MERCED RIVER

New Exchequer Dam, increased during this period. The Merced Irrigation District and the Division of Safety of Dams of the Department of Water Resources agreed that releases should be adjusted to equal the inflows so as not to cause a further increase in the storage head. On June 23, the releases were increased through the cone dispersion valve and reached about 8,500 cfs by the morning of June 26. Then the cone of the dispersion valve failed, and the outlet tunnel works had to be closed off. There were also some mechanical problems with the powerhouse generator, and no releases could be made through its outlet works. As a result, the only controlled release capability that remained was the gated spillway. Therefore, the gates were opened to keep the reservoir from gaining additional storage.

A mean daily peak discharge of 9,300 cfs from New Exchequer occurred from June 30 through July 5. The Division of Safety of Dams requested that water in storage be lowered to elevation 837 ft. and that the reservoir be operated below this level until repairs had been made.

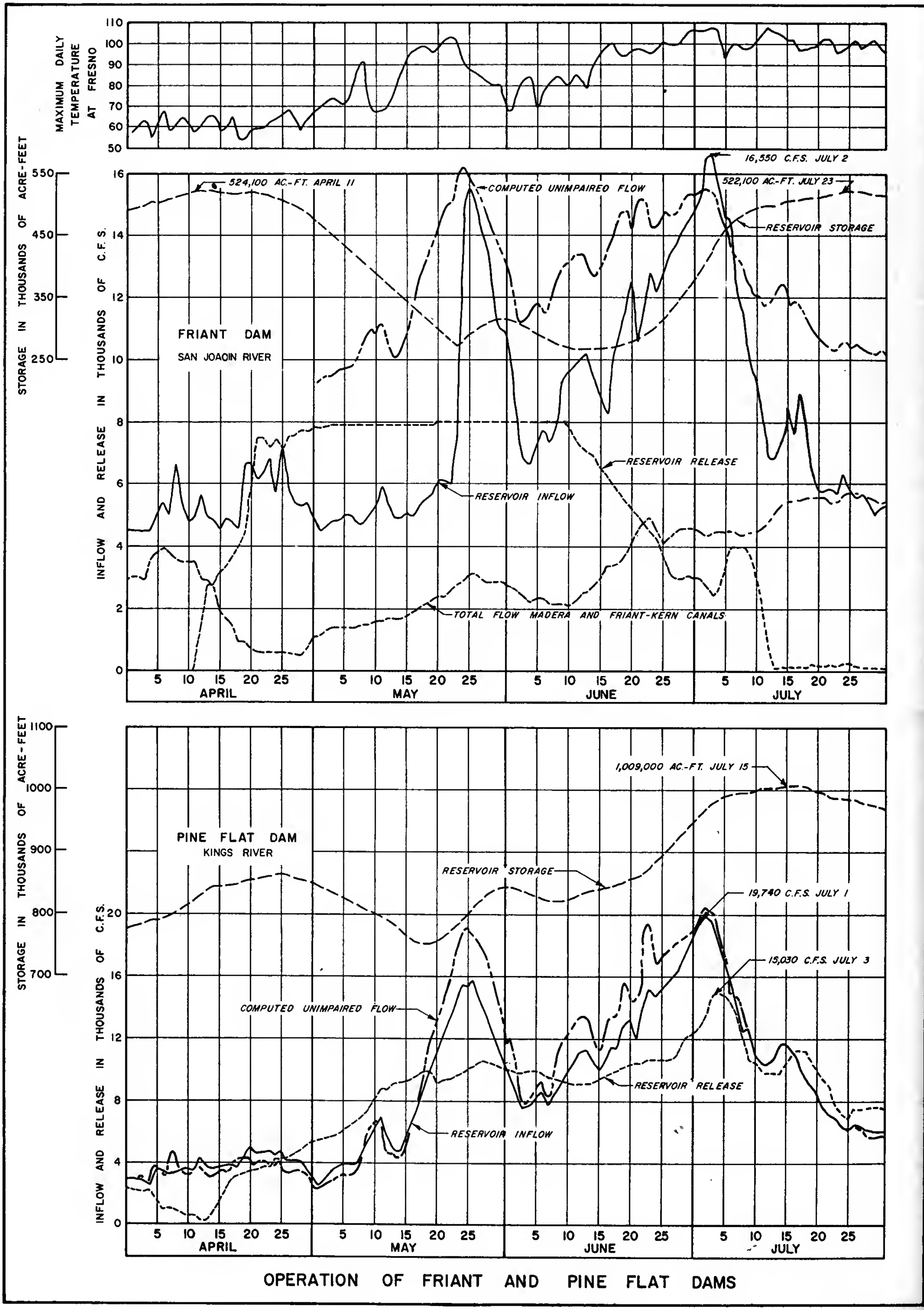
On June 26, the maximum releases from McSwain to the river channel reached 7,500 cfs. With a channel capacity of 6,000 cfs, some of the lower agricultural lands adjacent to the river experienced flood problems. It was estimated by personnel from the Department of Water Resources that about 172 acres of agricultural land and about 36 acres of native grassland were flooded. When the inflow began to drop on July 4, the situation began to improve. By July 12, the reservoir storage had decreased to about 42,000 acre-feet.

Hydrographs of the reservoir operation of New Exchequer Dam are shown in Plate 26, page 56. The unimpaired April-July runoff inflow to New Exchequer was 1,230,000 acre-feet or 198 percent of normal.

Fresno River and Chowchilla River

The Fresno and Chowchilla River Basins are adjacent watersheds located between the Upper San Joaquin and Merced River Basins. As relatively low-elevation basins, the Fresno and Chowchilla Rivers normally do not cause snowmelt flood problems. However, with the unusually heavy low-elevation snowpack this year, the Fresno River caused considerable flood damage in mid-April.

Two breaks in private levees were reported approximately 5 to 6 miles upstream from the Chowchilla Bypass. One break in the North levee was located approximately 1,000 feet west of County Road No. 16. The water from this break flooded to the north and west and inundated approximately 500 acres. A second break in the south levee was located approximately 2,300 feet east of County Road No. 16. The water from this break flooded to the south and west inundating about 1,300 acres. The water from these levee breaks flowed westerly and eventually returned to the Fresno River and the Chowchilla Canal Bypass. In Plate 27, page 58, is shown the hydrograph of the flow in the Fresno River at Knowles during the April-July period. The maximum flow reached was 1270 cfs on April 18, which is the highest flow of record due to snowmelt.



OPERATION OF FRIANT AND PINE FLAT DAMS

Upper San Joaquin River

Friant Dam, located at the mouth of the Upper San Joaquin Basin*, retains the waters of Millerton Lake. The reservoir has a maximum storage capacity of 520,500 acre-feet and provides the major flood control regulation for the San Joaquin River. Upstream from Friant Dam are: Crane Valley Dam, Shaver Lake, Huntington Lake, Mammoth Pool, Florence Lake, and T. A. Edison Dam. These upstream reservoirs, constructed for power production, are part of the Southern California Edison System and have a combined storage capacity of 573,400 acre-feet.

The April 1, 1967 water conditions report, prepared by the Department of Water Resources, forecast an April-July unimpaired runoff of 1,620,000 acre-feet for the San Joaquin River Basin. On May 1, the April-July forecast was revised upward to 2,440,000 acre-feet of unimpaired runoff, or 201 percent of average. About 250,000 acre-feet of runoff occurred during April, and the actual May-July unimpaired runoff was 2,077,000 acre-feet.

There is a total reservoir storage capacity of 1,104,000 acre-feet in the basin. 425,000 acre-feet of this combined reservoir storage space was available on April 1. At that time, the storage at Friant Dam was 492,100 acre-feet. Outflow from Friant consisted of releases to the river channel and diversions for irrigation through the Madera and Friant-Kern canals. During the first ten days of April, minimal releases of about 32 cfs were made to the river, while irrigation releases averaged about 3,400 cfs.

An increase in release from Friant was initiated on April 11 to provide additional storage space for regulating the forecasted snowmelt runoff. The releases were maintained at or near the 8,000-cfs channel capacity from April 20 until June 9. With Friant Dam gaining an additional 250,000 acre-feet of storage space from April 11 to May 22, and with 465,000 acre-feet of available storage space in the reservoirs above Friant on May 1, the snowmelt flows were curtailed without difficulty.

The peak mean daily unimpaired runoff to Friant was computed to be over 16,000 cfs during May. Above normal temperatures during the last half of June and through the first four days of July resulted in unimpaired inflows reaching a peak of about 15,500 cfs on July 3. On July 4, the unimpaired flows began to decline even though the temperature remained high, which indicated the snowpack no longer had the potential to continue to produce significant snowmelt runoff.

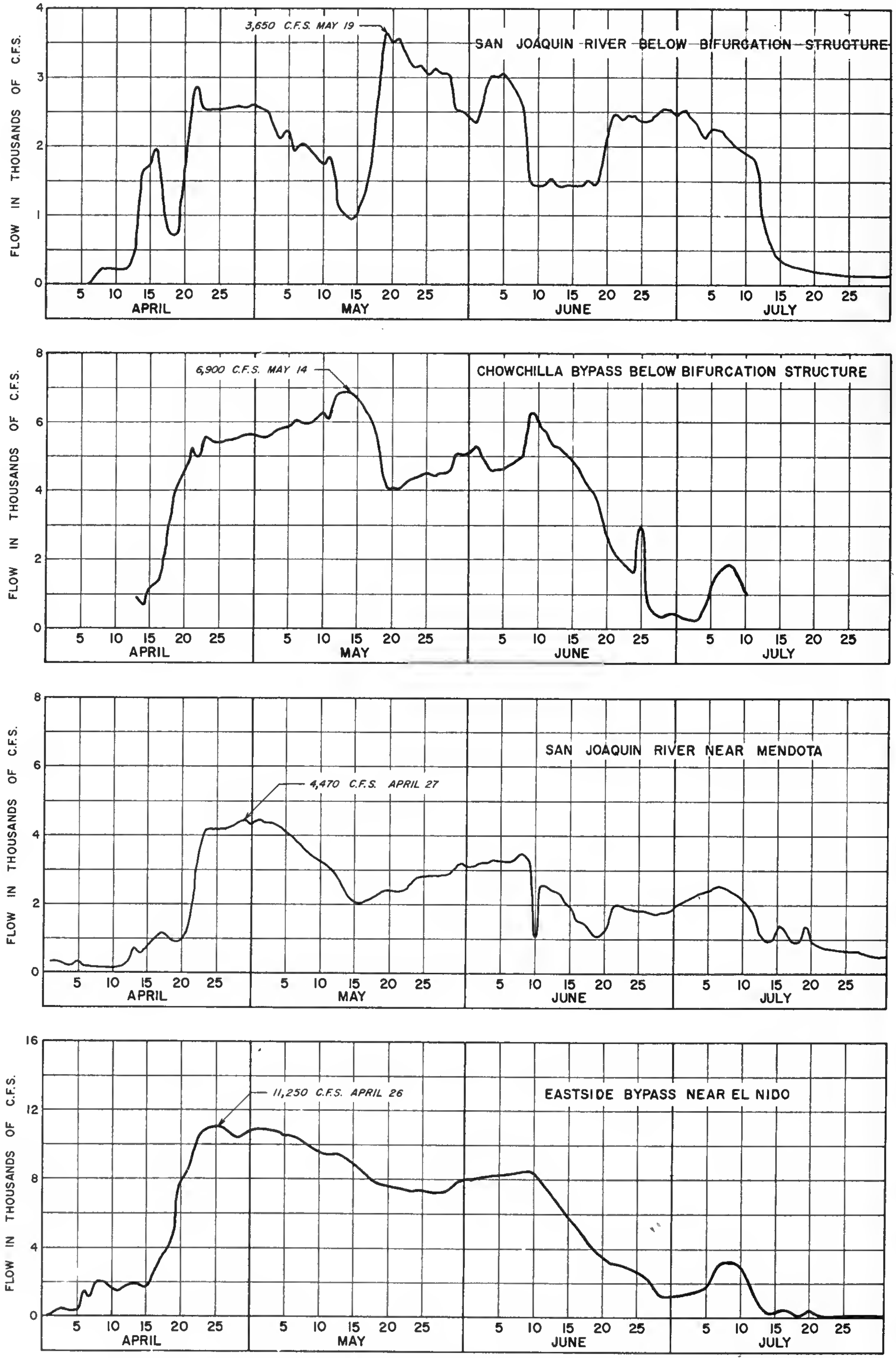
In Plate 28, page 60, are shown the full natural unimpaired flow for the Upper San Joaquin Basin and hydrographs of inflow and releases for Millerton Lake.

On June 9, the U. S. Bureau of Reclamation began decreasing releases from Friant to start filling the reservoir. From June 15, through July 23, Friant gained approximately 250,000 acre-feet of storage. By July 12, releases to the river channel once again were at a minimum of 176 cfs, while irrigation releases were approaching their maximum values.

Lower San Joaquin River

After leaving Friant Dam, the water from the San Joaquin River enters the Chowchilla Canal Bypass and San Joaquin River structures. These facilities are

*As used in this report, Upper San Joaquin Basin refers to that portion of the drainage area above Friant Dam.



HYDROGRAPHS OF SAN JOAQUIN RIVER AND EASTSIDE BYPASS SYSTEM

features of the Lower San Joaquin River Flood Control Project, built by the Department of Water Resources and completed early in 1967. The gates of these two structures divide the flow into the San Joaquin River and Mendota Pool and into the Chowchilla Canal Bypass. The Lower San Joaquin Flood Control Project was effective in preventing the valley from becoming inundated. The flooding was reduced principally to small local areas of seepage and boils along the lower reaches of the river. In previous years, many thousands of acres were subject to overflow.

The channel capacity below Friant to the control structure is 8,000 cfs. The Chowchilla Canal Bypass was designed to pass a maximum flow of 5,500 cfs. After flow division at the control structure, the remaining flow is diverted down the old San Joaquin River Channel to the Mendota Pool. Hydrographs for April-July of the flow in the Chowchilla Canal Bypass and in the San Joaquin River below the Bypass structure are shown on Plate 29, page 62. During the April-July period, the Chowchilla Canal Bypass safely conveyed over 1,000,000 acre-feet of water through the valley trough.

In addition to San Joaquin River water, the Kings River water diverted north through Fresno Slough of James Bypass also arrives at the Mendota Pool.

A hydrograph of the San Joaquin River at Mendota (just below Mendota Pool) is shown in Plate 29, page 62, for the April-July period. Further downstream, hydrographs of the April-July flow for the Eastside Bypass near El Nido are also shown in Plate 29. The maximum snowmelt flow that occurred in the San Joaquin River at Vernalis was 26,100 cfs on April 30. A hydrograph showing this flow is on Plate 25.

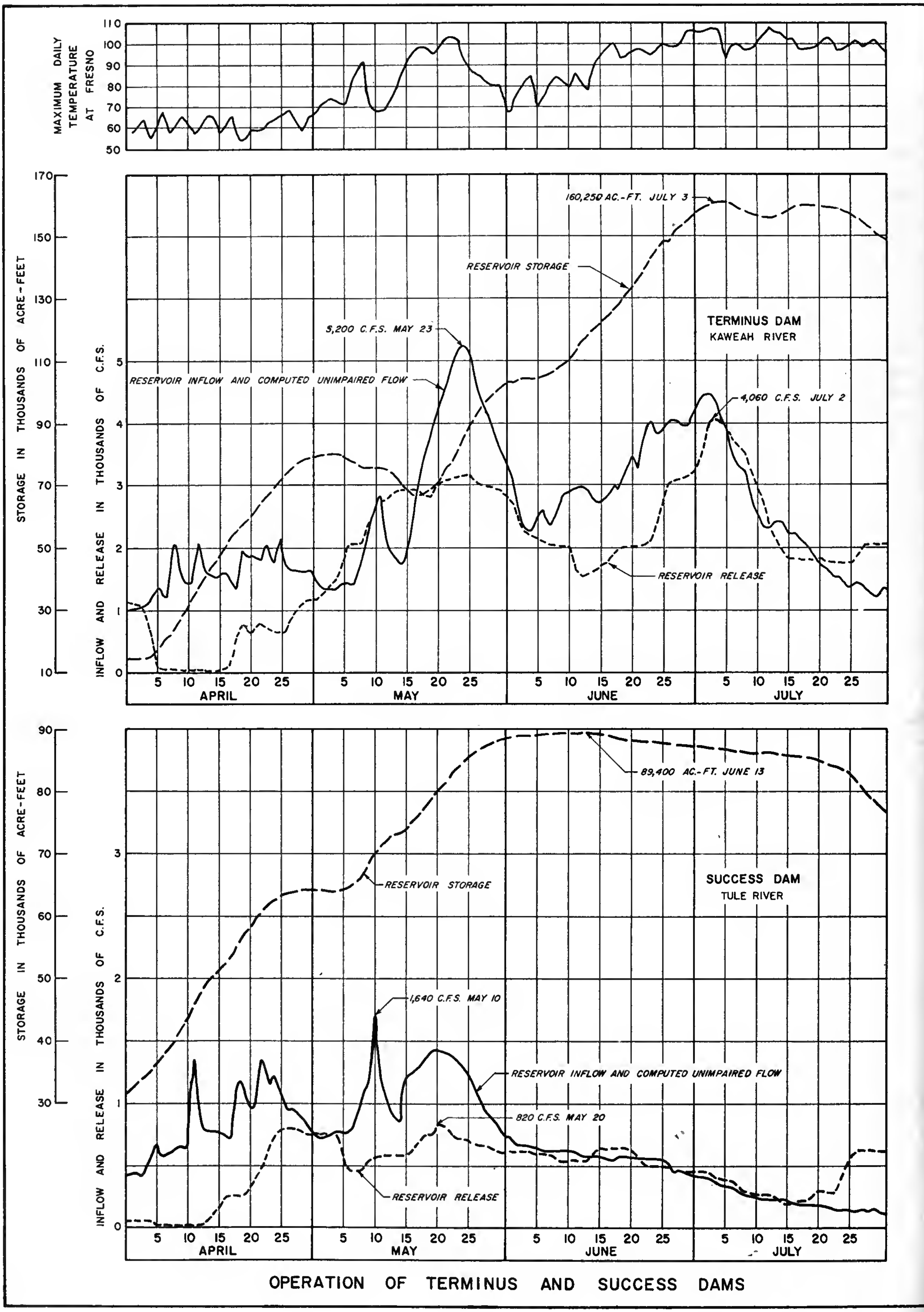
Kings River

Pine Flat Dam, which has a maximum storage capacity of 1,000,000 acre-feet, receives virtually all of the runoff from snowmelt in the Kings River Basin. There are only two small power-regulating reservoirs in the upper basin: Courtright, which has a storage capacity of 123,300 acre-feet; and Wishon, with a storage capacity of 128,000 acre-feet. All of these reservoirs provide a combined maximum total reservoir storage capacity of 1,251,300 acre-feet in the basin, of which there was 396,000 acre-feet available on April 1.

The Department of Water Resources, on April 1, forecast an April-July unimpaired runoff of 1,650,000 acre-feet for the Kings River Basin. The actual runoff recorded for April was 210,000 acre-feet. The forecast was revised upward on May 1, leaving 2,030,000 acre-feet of runoff to occur during May-July with only 350,000 acre-feet of available storage remaining in the basin. The actual unimpaired April-July runoff was 2,277,300 acre-feet.

Releases from Pine Flat Reservoir were increased from 300 cfs beginning on April 13 and reached almost 9,000 cfs on May 18. This resulted in an increase in the available reservoir storage from 153,000 acre-feet on April 13 to 258,000 acre-feet on May 18. Mean daily inflows to Pine Flat reached nearly 16,000 cfs on May 26, due to above normal temperatures, and then decreased with cooler temperatures. Sustained high temperatures from the latter part of June through the first week of July caused a peak mean daily inflow to Pine Flat Reservoir of about 19,740 cfs on July 2.

The maximum release from Pine Flat was about 15,000 cfs on July 4. A peak flow of 3,700 cfs during this period was diverted north to the San Joaquin



OPERATION OF TERMINUS AND SUCCESS DAMS

River. A maximum of 2,900 cfs was diverted to Kings River south into Tulare Lake. A total of 67,000 acre-feet reached Tulare Lake from April through July. The balance of the release from Pine Flat was used for irrigation through the extensive network of irrigation canals.

In Plate 28, page 60, are shown the Kings River Basin full natural runoff for April-July and the inflow and releases for Pine Flat Dam. A mean daily unimpaired flow into Pine Flat Reservoir of about 19,200 cfs was experienced from the near normal temperatures in May, and a computed peak mean daily flow of about 20,500 cfs occurred on July 2.

Some flooding of orchard and croplands within the floodplain occurred during period of high flows. No flooding of lands outside the floodplain was reported.

Increased releases in April provided an additional storage space of over 100,000 acre-feet in Pine Flat Reservoir before the major snowmelt period began. This additional storage, combined with the substantial releases throughout the snowmelt period, provided sufficient storage space to regulate the inflow and avoid any major flood damage along the Kings River channels.

Kaweah River

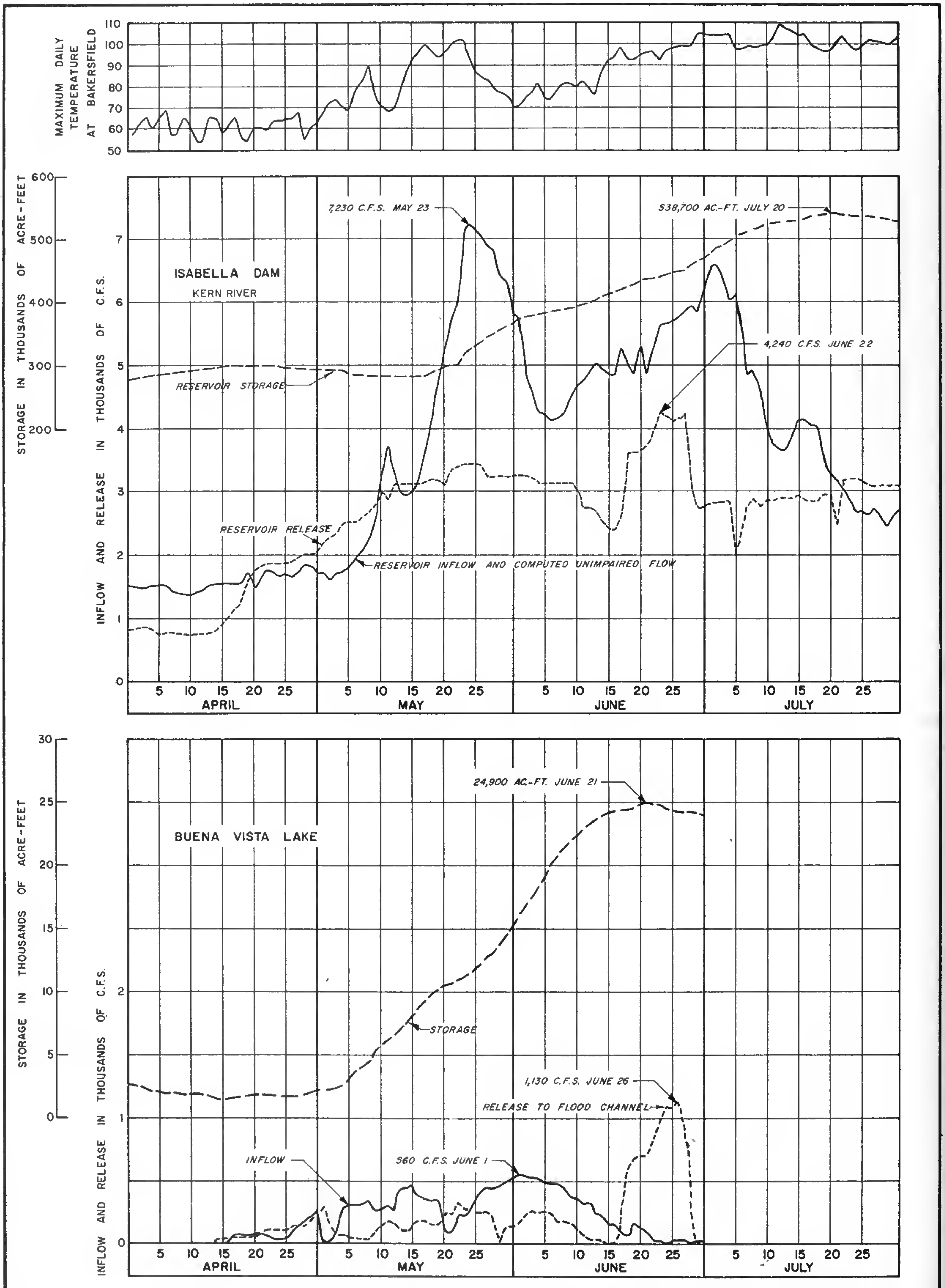
On May 1, the forecast for April-July unimpaired runoff for the Kaweah River was 610,000 acre-feet, or 232 percent of average. Terminus, the only flood control reservoir in the basin, has a maximum storage capacity of 150,000 acre-feet, of which there was 135,000 acre-feet available on April 1. During April, 95,000 acre-feet of runoff occurred, of which 64,000 acre-feet was stored behind Terminus Dam. The maximum mean daily inflow to Terminus was about 5,200 cfs on May 23, and the maximum release was about 4,060 cfs on July 2 and 3. The channel capacity downstream from Terminus Dam is about 5,000 cfs for sustained flows, so no significant flooding from snowmelt runoff occurred along the Kaweah River.

Early in May, the U. S. Corps of Engineers decided to construct a temporary eight-foot retaining wall on the spillway of Terminus Dam to increase its storage capacity by about 13,000 acre-feet. The additional storage capacity helped retain flood water that otherwise might have flowed into Tulare Lake; in addition, it provided additional water for irrigation later in the year.

Tule River

Success Dam, the only flood control structure in the Tule River Basin, has a storage capacity of 85,440 acre-feet. The total available storage remaining in the reservoir on April 1 was about 48,000 acre-feet. The runoff during April was about 50,000 acre-feet, leaving 100,000 acre-feet of forecasted snowmelt for the May-July period. Much of the April runoff was stored in Success Reservoir leaving only 23,200 acre-feet of available reservoir storage on May 1.

The Corps of Engineers constructed a temporary five-foot retaining wall on the spillway of Success Dam during May to increase the total reservoir storage capacity to 98,200 acre-feet.
On May 25, the reservoir storage reached the spillway crest. The additional reservoir space provided by the retaining wall on the spillway was sufficient



OPERATION OF ISABELLA DAM AND HYDROGRAPH OF BUENA VISTA LAKE

to prevent excess flood water from flowing into Tulare Lake from Tule River. Further, the extra water stored provided additional irrigation water for use later in the summer. The maximum mean daily inflow into Success Reservoir was 1,640 cfs on May 10, and the maximum release reached 820 cfs on May 20. The inflow and outflow hydrographs during the April-July period are shown in Plate 30, page 64.

Kern River

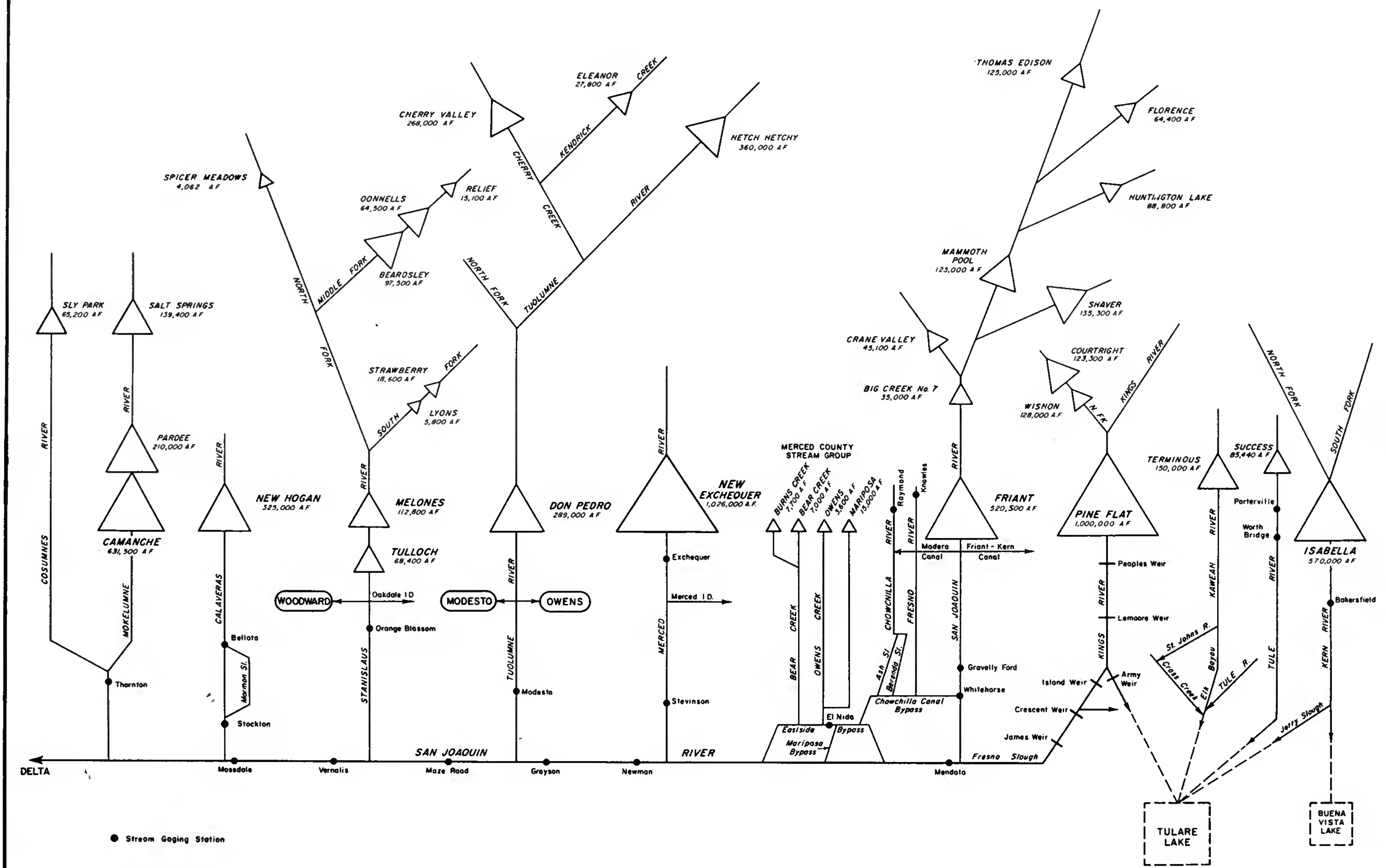
Isabella is the only major storage reservoir in the Kern River Basin. The reservoir has a maximum storage capacity of 570,000 acre-feet, of which 290,000 acre-feet was available for storage on April 1, 1967. This was sufficient storage to retain the Kern River Basin snowmelt runoff without any difficulty. The peak mean daily inflow to the lake was about 7,200 cfs on May 24, and the maximum mean daily release was a flow of 4,240 cfs on June 22. Downstream Channel capacity, aided by irrigation diversions during this period, was adequate to convey flows of this magnitude.

On July 21, the maximum storage behind Isabella reached 538,700 acre-feet. Downstream in Buena Vista Lake, cells No. 1 and No. 2 were used to store inflow for future summer irrigation.

On Plate 31, page 66, are shown the April-July hydrographs of the reservoir operation.

Table 14: Summary of Flooded Areas and Damages Caused by Snowmelt Runoff

Stream & Reach	Acres Flooded	Primary Flood Damages in $1000					
		Agri-cultural	Resi-dential	Commercial	Industry & Utilities	Public Facilities	Total
Stanislaus River	3,250	500	0	17	4	19	540
San Joaquin River	29,250	1,562	7	139	182	117	2,007
Kings River	10,200	705	25	39	38	94	901
Tulare Lakebed	39,950	1,471	0	0	88	18	1,577
TOTAL DAMAGE	82,650	4,238	32	195	312	248	5,025



SAN JOAQUIN VALLEY STREAM SYSTEM

Table 15: RESERVOIR OPERATIONS (October 1, 1966 to August 31, 1967)

Stream	Reservoir	Capacity Acre-Feet	Storage in Acre-Feet December 1, 1966	April 1, 1967	Peak Storage in Acre-Feet and Date		Peak Inflow in CFS and DATE		Peak Discharge in CFS and DATE	
hasta River	Dwinnell	72,000	5,630	37,050	46,760	6/ 3/67	5,645P	12/ 4/66	90P	7/ 3/67
rinity River	Clair Engle Lake	2,500,000	1,710,370	2,135,100	2,497,110	5/30/67	13,050*	1/29/67	5,393*	6/ 1/67
ad River	Ruth	51,800	35,850	52,500	58,190	1/29/67	6,988*	12/ 5/66	5,980P	1/29/67
. Fork Russian River	Lake Mendocino	122,500	56.620	74,600	88,410	1/30/67	7,120	1/21/67	4,200	1/31/67
lear Creek	Whiskeytown	250,000	200,800	202,200	239,880	10/21/66	5,805*	12/ 4/66	3,742*	12/18/66
acramento River	Shasta Lake	4,500,000	3,337,700	4,099,200	4,550,300	5/19/67	91,280B	12/ 4/66	49,540B	12/ 8/66
tony Creek	East Park	51,0000	9,690	51,280	51,830	4/24/67	2,266*	1/22/67	1,557*	1/29/67
tony Creek	Stony Gorge	50,000	14,780	50,490	52,400	5/ 9/67	6,268*	1/29/67	5,602*	1/29/67
tony Creek	Black Butte	160,000	30,800	104,300	149,720	6/ 9/67	17,000*	1/30/67	9,900*	2/ 1/67
. Fork Feather River	Lake Almanor	1,308,000	667,990	701,830	1,022,140	7/ 2/67	N.A.	N.A.	1,850P	7/11/67
ittle Last Chance Cr.	Frenchaman	55,400	37,400	52,030	59,090	5/22/67	N.A.	N.A.	521*	5/22/67
ig Grizzly Creek	Lake Davis	84,150	(E) 320	18,430	53,500	6/27/67	N.A.	N.A.	(E) 23*	12/ 3/66
ndian Creek	Antelope	22,500	18,000	23,150	24,820	5/24/67	N.A.	N.A.	682*	5/24/67
utt Creek	Butt Valley	49,800	35,420	44,600	45,270	6/21/67	N.A.	N.A.	2,453P	7/ 6/67
ucks Creek	Bucks Lake	103,000	44,920	63,860	105,790	7/ 1/67	N.A.	N.A.	N.A.	N.A.
. Fork Feather River	Little Grass Valley	93,000	52,850	56,220	92,850	6/16/67	1,484P	5/25/67	1,037P	5/26/67
ost Creek	Sly Creek	65,050	38,560	74,730	64,990	6/21/67	1,644P	6/13/67	1,327P	5/26/67
. Fork Yuba River	Spaulding	74,500	38,295	46,760	75,040	7/13/67	N.A.	N.A.	N.A.	N.A.
. Fork Yuba River	Bullards Bar	31,500	31,490	32,680	35,820	1/29/67	N.A.	N.A.	19,894P	1/29/67
uba River	Englebright	70,000	72,020	71,620	77,220	1/21/67	22,570*	1/21/67	47,660	1/21/67
eer Creek	Scotts Flat	49,000	16,870	48,760	49,200	3/19/67	N.A.	N.A.	N.A.	N.A.
ache Creek	Clear Lake	420,000	78,600	319,210	330,150	3/17/67	N.A.	N.A.	4,144P	1/27/67
erle Creek	Loon Lake	76,500	14,800	23,200	77,600	7/ 7/67	1,080*	5/17/67	830*	7/ 6/67
Fork Silver Creek	Ice House	46,000	19,000	11,400	46,200	6/30/67	750*	6/16/67	645*	6/30/67
ilver Creek	Union Valley	271,000	111,000	140,900	268,700	7/12/67	3,250*	5/24/67	1,200*	7/ 2/67
ubicon River	Hell Hole	208,400	158,480	167,020	209,294	6/18/67	4,843*	5/22/67	2,764*	6/18/67
merican River	Folsom	1,000,000	603,300	630,400	1,002,600	7/ 3/67	31,700*	3/17/67	36,000*	1/30/67
utah Creek	Lake Berryessa	1,600,000	1,379,500	1,637,700	1,680,790	1/31/67	71,300B	1/21/67	6,490B	1/31/67
y Park Creek	Jenkinson Lake	41,000	22,160	41,220	41,730	5/18/67	611*	1/30/67	201*	3/17/67
ear River	Lower Bear River	48,500	13,360	8,320	49,080	7/10/67	N.A.	N.A.	405*	7/10/67
Fork Mokelumne River	Salt Springs	139,400	24,700	39,560	141,850	7/ 9/67	4,360*	5/23/67	4,050*	6/25/67
kelumne River	Pardee	210,000	170,820	194,000	211,440	7/ 9/67	7,044P	6/18/67	5,040*	5/23/67
kelumne River	Camanche	431,500	73,600	273,930	425,700	7/14/67	5,040*	5/23/67	3,110P	5/24/67
laveras River	New Hogan	325,000	139,300	187,200	241,250	4/18/67	17,500B	1/21/67	5,000B	4/21/67
ttlejohn Creek	Farmington	52,000	0	276	8,350	1/22/67	6,395*	4/11/67	2,054*	4/ 8/67
Fork Stanislaus River	Donnells	64,500	14,630	25,150	64,320	7/16/67	6,063P	6/17/67	4,778P	6/18/67
Fork Stanislaus River	Beardsley	97,500	45,600	68,300	97,800	7/16/67	6,544P	5/26/67	6,144P	5/26/67
anislaus River	Melones	112,600	38,140	92,985	114,460	7/17/67	12,960B	5/24/67	12,005B	5/25/67
anislaus River	Tulloch	68,400	29,360	57,600	66,970	7/16/67	14,659B	5/25/67	10,302B	5/31/67
olumne River	Hetch-Hetchy	360,000	140,400	97,800	363,920	7/12/67	13,510P	7/ 3/67	8,223P	7/ 7/67
erry Creek	Cherry Valley	268,000	26,510	82,640	268,810	7/15/67	2,951*	7/ 3/67	1,812P	7/ 7/67
eanor Creek	Lake Eleanor	27,800	6,990	5,040	27,290	8/ 2/67	2,012P	6/19/67	1,750P	6/19/67
olumne River	Don Pedro	289,000	94,100	200,400	290,800	7/16/67	11,750*	4/ 7/67	10,446*	7/ 1/67
rced River	Lake McClure	1,026,000	280,220	657,500	991,600	6/28/67	21,500*	12/ 6/66	9,300*	6/29/67
rced River	McSwain	9,480	3,100	8,600	9,730	4/20/67	9,300*	6/29/67	9,230*	6/29/67
rns Creek	Burns	6,800	0	7	400	4/11/67	1,887*	4/11/67	1,242*	4/11/67
ar Creek	Bear	7,700	0	1	900	12/ 6/66	2,095B	12/ 6/66	1,060B	12/ 6/66
ens Creek	Owens	3,600	0	2	310	4/11/67	689B	4/11/67	100B	4/11/67
riposa Creek	Mariposa	15,000	162	0	2,600	12/ 7/66	3,752B	12/ 6/66	740B	12/ 7/66

Table 15: (Continued)

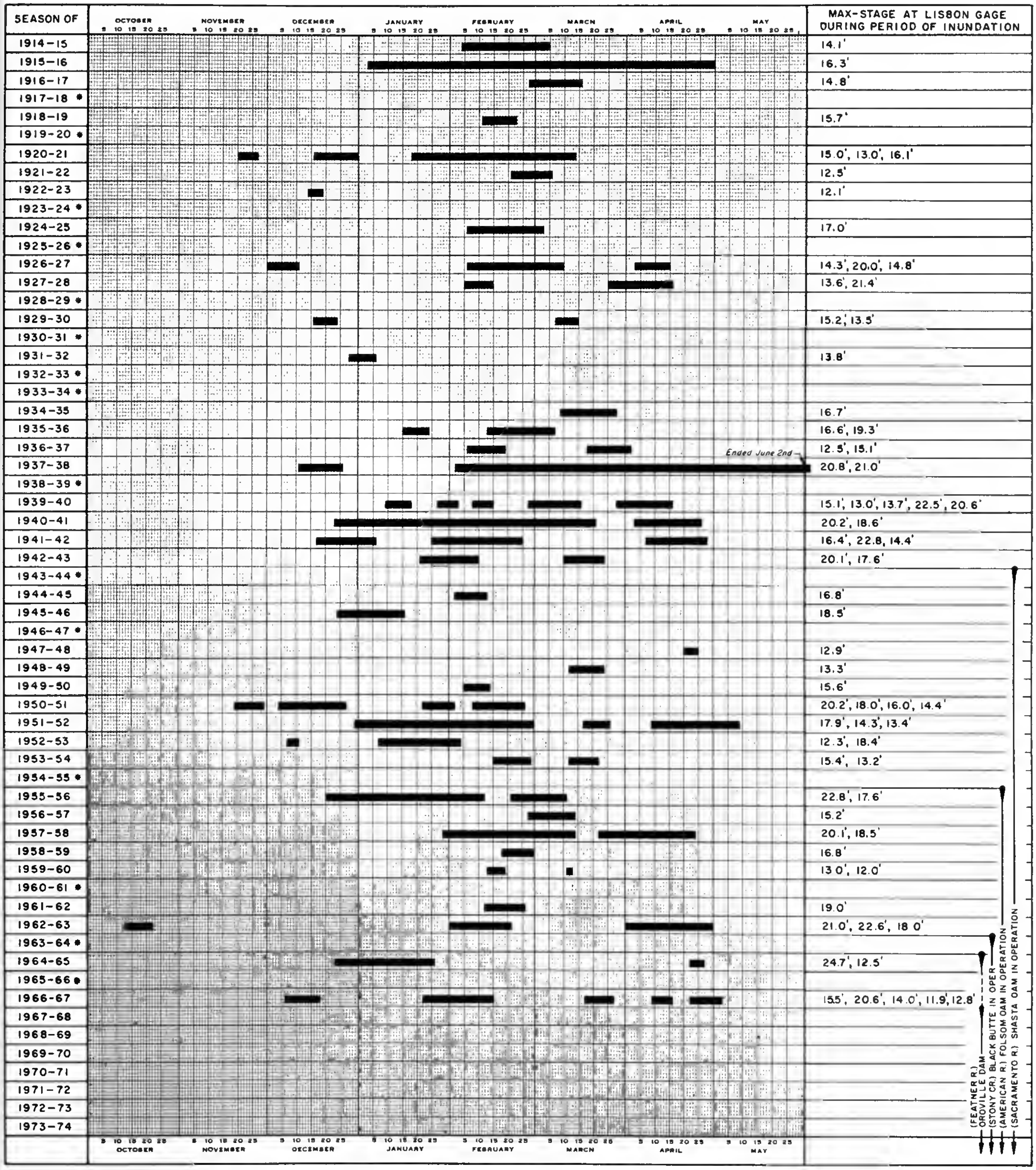
Stream	Reservoir	Capacity Acre-Feet	Storage in Acre-Feet		Peak Storage in Acre-Feet and Date		Peak Inflow in CFS and DATE		Peak Discharge in CFS and DATE	
			December 1, 1966	April 1, 1967						
N. F. San Joaquin River	Crane Valley	45,400	22,860	30,120	45,390	7/ 5/67				
S. F San Joaquin River	Lake Florence	64,400	406	413	64,730	8/ 7/67	3,765*	7/ 2/67	3,765*	7/ 2/67
Mono Creek	Lake T.A. Edison	125,000	75,300	13,980	125,280	8/ 9/67	1,694*	7/ 1/67	698*	7/15/67
San Joaquin River	Mammoth Pool	123,000	30,510	59,950	125,530	7/ 2/67	17,120*	12/ 6/66	15,028*	7/ 2/67
San Joaquin River	Redinger Lake	35,000	24,060	25,850	25,980	1/21/67	15,474*	7/ 2/67	15,487*	7/ 1/67
San Joaquin River	Millerton Lake	520,500	204,100	494,800	524,100	4/11/67	18,409 P	7/ 3/67	11,295 P	5/25/67
Big Creek	Huntington Lake	88,800	70,817	41,510	89,340	8/10/67	2,840*	7/ 3/67	2,047*	7/12/67
Stevenson Creek	Shaver Lake	135,300	57,390	40,810	135,440	8/ 9/67	2,611*	12/ 6/66	626*	7/12/67
Helms Creek	Courtwright	123,300	56,400	62,530	124,190	7/13/67	520E	12/ 6/66	650P	7/ 3/67
N. Fork Kings River	Wishon	128,000	21,420	33,130	128,770	7/ 7/67	3,400E	12/ 6/66	2,669P	7/ 8/67
Kings River	Pine Flat	1,000,000	225,100	781,800	1,009,800	7/15/67	91,000P	12/ 6/66	15,310*	7/ 3/67
Kaweah River	Terminous	150,000	7,800	14,900	160,470	7/ 3/67	105,000P	12/ 6/66	4,060*	7/ 2/67
Kaweah River	Terminous (after) (May 24)	165,500	8' Retention wall built in spillway							
Tule River	Success	85,440	7,300	32,500	101,290	12/ 7/66	61,000P	12/6/66	8,810P	12/ 7/66
Tule River	Success (after) (May 24)	98,200	5' Retention wall built in spillway							
Kern River	Isabella	570,000	82,700	281,800	538,700	7/20/67	120,000P	12/ 6/66	4,240*	6/21/67
Prosser Creek	Prosser Creek	30,000	9,610	9,060	30,550	7/31/67	1,034*	5/23/67	912*	6/ 1/67
Little Truckee River	Boca	41,200	5,600	5,210	40,800	7/17/67	2,090*	5/22/67	1,980*	5/23/67
San Antonio River	San Antonio	350,000	19,960	112,145	146,860	6/22/67	10,505*	12/ 6/66		
Nacimento River	Nacimento	350,000	52,960	278,700	353,120	5/22/67	90,000(E)	12/6/66		

LEGEND

*	Mean Daily Figure
E	Estimated Figure
N.A	Not Available
P	Instantaneous Peak
B	Bi-Hourly Flows

New Exchequer Dam spillway during snowmelt period, June 1966

PERIOD OF RECORD OF INUNDATION OF THE YOLO BYPASS



NOTE:

Data compiled from records of D.W.R. stream gaging station "Yolo Bypass near Lisbon."

Datum: 0=U.S.E.D. Datum

Period of Record: 1914 to Present

Assumed overflow of Bypass at stage above 11.5' on the Lisbon gage.

LEGEND

▬ Designates period of inundation of Bypass.

* Designates season Bypass not inundated.

Table 16

Peak Flows and Stages
(Preliminary Data, Subject to Revision)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area									
Smith River near Crescent City	609[r]	1931-	USGS	12/22/64	48.5	228,000	1/28/67	30.35	87,800
Shasta River near Yreka	793[r]	1933-41 1944-	USGS	12/22/64	12.92	21,500[c]	12/ 5/66	5.64	1,390
Scott River near Fort Jones	653[r]	1941-	USGS	12/22/64	25.0	54,600	1/29/67	12.38	6,430
Klamath River near Seiad Valley	6,980	1912-25 1951-	USGS	12/22/64	33.75	165,000[c]	1/29/67	12.24	19,600
Salmon River at Somesbar	746	*1911-	USGS	12/22/64	43.4[h]	133,000	1/29/67	13.00	21,000
Klamath River at Orleans	8,480	1927-	USGS	12/22/64	76.5[h]	307,000[c]	1/29/67	24.07	99,600
Trinity River above Coffee Creek, near Trinity Center	149	1957-	USGS	12/22/64	12.30	20,800	11/19/66	7.98	5,720
Trinity River at Lewiston	728[r]	1911-	USGS	12/22/55	27.3[h]	71,600	5/30/67	6.00	2,690
North Fork Trinity River at Helena	151	1911-13 1957	USGS DWR	12/22/64	27.93[h]	35,800	1/29/67	15.00	4,875
Trinity River near Burnt Ranch	1,439[r]	1931-40 1956	USGS	12/22/55	43.2[h]	172,000	1/29/67	13.21	14,000
New River at Denny	173	1927-28 1959-	USGS	12/22/64	38.7[h]	60,000[e]	1/29/67	15.14	5,270
Hayfork Creek near Hyampom	378[r]	1956-	USGS	12/22/64	19.14	28,800	12/ 5/66	12.73	10,300
South Fork Trinity River near Salyer	898[r]	1911-13 1950-	USGS	12/22/64	47.6	95,400	1/29/67	21.95	29,300
Willow Creek near Willow Creek	43.3	1959-	USGS	12/22/64	25.3[h]	17,000[e]	1/29/67	7.33	1,460
Trinity River at Hoopa	2,847[r]	*1911-	USGS	12/22/64	40.3	231,000[c]	1/29/67	33.38	56,400[c]
Klamath River near Klamath	12,100	*1910-	USGS	12/23/64	55.3	557,000[c]	1/29/67	26.57	152,000[c]
Redwood Creek at Orick	278	1911-13	USGS	12/22/64	24.0	50,500	12/ 5/66	15.81	24,300
Little River at Crannel	44.3	1955-	USGS	1/ 4/66	11.12	8,300	12/ 4/66	9.58	6,320

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1965-66 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
<u>North Coastal Area</u> (Continued)									
Mad River near Forest Glen	143	1953-	USGS	12/22/55	24.5	39,200	1/29/67	9.35	6,630[c]
Mad River near Arcata	484	1910-13 1950-	USGS	12/22/55	27.30[b]	77,800	12/ 5/66	18.15	30,900
Elk River near Falk	44.2	1957-	USGS	12/22/64	28.09	3,430	12/ 5/66	26.71	2,920
Eel River below Scott Dam, near Potter Valley	290	1922-	USGS	12/22/64	24.24[h]	56,300[h]	12/ 5/66	15.62	14,900[c]
Eel River at Van Arsdale Dam, near Potter Valley	349	*1909-	USGS	12/22/64	33.9[h]	64,100[c]	12/ 5/66	18.77	16,000[c]
Outlet Creek near Longvale	161[r]	1956-	USGS	12/22/64	30.6[h]	77,900	1/20/67	13.24	13,400
Black Butte River near Covelo	162	*1951-	USGS	12/22/64	26.4[h]	29,000	1/28/67	18.0[m]	9,000[e]
M. F. Eel River below Black Butte River near Covelo	367	1951-	USGS	12/22/64	31.7[h]	133,000	1/28/67	20.0[m]	18,000[e]
Eel River below Dos Rios	1,484	1911-13 1951-	USGS	12/22/64	62.5[h]	460,000[c]	Discontinued		
North Fork Eel River near Mina	250	1953-	USGS	12/22/64	34.5[h]	133,000	12/ 2/66	18.35	19,600
Eel River at Fort Seward	2,079	1955-	USGS	12/22/64	87.2[h]	561,000[c]	12/ 5/66	31.75	86,800[c]
South Fork Eel R. nr. Branscomb	43.9	1946-	USGS	12/22/55	16.20	20,100	1/29/67	7.47	3,480
Tenmile Creek near Laytonville	50.3	1957-	USGS	12/22/55	22.9[h]	16,300	1/26/67	12.34	5,000
South Fork Eel River near Miranda.	537	1939-	USGS	12/22/64	46.0[h]	199,000	12/ 5/66	19.01	35,800
Bull Creek near Weott	28.1	1960-	USGS	12/22/64	20.6[h]	6,520	12/ 5/66	-	4,800[e]
Eel River at Scotia	3,113	*1910-	USGS	12/23/64	72.0[h]	752,000[c]	12/ 5/66	32.95	154,000
South Fork Van Duzen River nr. Bridgeville	36.2	*1951-	USGS	12/22/64	18.70	13,600	12/ 4/66	13.62	6,710
Van Duzen River near Bridgeville	216	1950-	USGS	12/22/64	22.6	48,700	12/ 4/66	17.91	26,600

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area (Continued)									
Mattole River near Petrolia	240	*1911-	USGS	12/22/55	29.60	90,400	12/ 4/66	21.68	42,400
Noyo River near Fort Bragg	106	1951-	USGS	12/22/64	26.30	24,000	1/21/67	13.63	3,980
Rancheria Creek near Boonville	65.6	1959-	USGS	12/22/64	20.52	20,000	1/21/67	12.38	5,300
Navarro River near Navarro	303	1950-	USGS	12/22/55	40.60	64,500	1/21/67	24.27	16,100
South Fork Gualala River near Annapolis	161	1950-	USGS	12/22/55	24.57	55,000	1/21/67	18.45	28,800
Russian River near Ukiah	99.7	*1911-	USGS	12/21/55	21.0	18,900	1/20/67	9.83	6,300
East Fork Russian River near Calpella	93.0	1941-	USGS	12/22/64	20.21	18,700[c]	1/21/67	16.30	7,120[c]
Russian River near Hopland	362	1939-	USGS	12/22/55	27.00	45,000	1/21/67	16.71	15,500[c]
Feliz Creek near Hopland	31.1	1958-	USGS	12/22/64	14.10	6,080	Discontinued		
Russian River near Cloverdale	502	1951-	USGS	12/22/64	31.60	55,200[c]	1/21/67	19.92	20,400[c]
Big Sulphur Creek near Cloverdale	82.3	1957-	USGS	12/22/55	22.2[h]	20,000	1/21/67	12.61	10,200
Russian River near Healdsburg	793	1939-	USGS	12/23/64	27.00	71,300[c]	1/21/67	18.60	36,400[c]
Dry Creek near Cloverdale	87.8	1941-	USGS	12/22/64	18.09	18,100	1/21/67	12.18	8,490
Dry Creek near Geyserville	162	1959-	USGS	1/31/63	17.50	32,400	1/21/67	14.90	19,600
Santa Rosa Creek near Santa Rosa	12.5	1959-	USGS	2/ 8/60	13.35	3,200	1/21/67	10.97	1,830
Russian River near Guerneville (Summerhome)	1,340	*1939-	USGS	12/23/64	49.6	93,400[c]	1/21/67	42.45	68,500[c]
Austin Creek near Cazadero	63.1	1959-	USGS	2/13/62	20.6[j]	15,100	Discontinued		
San Francisco Bay Area									
Walker Creek near Tomales	37.1	1959-	USGS	1/ 5/66	22.23	5,420	1/21/67	21.18	4,930
Corte Madera Creek at Ross	18.1	1951-	USGS	12/22/55	17.45	3,620	1/21/67	17.44	3,120[c]

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record (a)	Source of Record (a)	Previous Maximum of Record Date	Stage in ft.	Dischg in cfs	1966-67 Water Year Date	Stage in ft.	Dischg. in cfs
San Francisco Bay Area									
Novato Creek near Novato	17.5	1946-	USGS	1/20/64	8.74	1,330	1/21/67	7.66	1,110[c]
Sonoma Creek at Boyea Hot Springs	62.2	1955-	USGS	12/22/55	17.10	8,880	1/21/67	13.10	6,070
Napa River near St. Helena	81.4[r]	*1929-	USGS	12/22/55	16.17	12,600	1/21/67	15.01	11,100
Dry Creek near Napa	17.4	1951-	USGS	2/24/58	8.11	3,460	Discontinued		
Napa River near Napa	218	*1929-	USGS	1/31/63	27.59	16,900	1/21/67	26.53	15,700[c]
Redwood Creek near Napa	9.81	1958-	USGS	1/ 5/65	10.44	1,450	1/21/67	9.63	1,280
San Ramon Creek at San Ramon	5.89	1952-	USGS	10/13/62	16.98	1,600	1/21/67	5.60	480
San Ramon Creek at Walnut Creek	50.8	1952-	USGS	1/31/63	14.40	7,980	1/21/67	10.70	4,290
Walnut Creek at Walnut Creek	79.2	1952-	USGS	4/ 2/58	20.2	12,200	1/21/67	8.97	7,120[c]
San Lorenzo Creek at Hayward	37.5	*1939-	USGS	10/13/62	19.73[h]	7,460	1/21/67	13.14	2,880[c]
Arroyo Mocho near Pleasanton	143	1962-	USGS	2/ 1/63	8.60	1,760	1/30/67	6.76	1,110
Arroyo Valle near Livermore	147	*1912-	USGS	12/23/55	13.93[h]	18,200	1/22/67	7.76	5,360
Arroyo Valle at Pleasanton	171	1957-	USGS	3/ 2/48	25.36	11,300	1/22/67	21.62	4,790
Alameda Creek near Niles	633	1891-	USGS	12/23/55	14.9	29,000[c]	1/22/67	11.15	13,600[c]
Patterson Creek at Union City	-	1958-	USGS	2/ 1/63	20.4[h]	10,500[c]	1/22/67	15.2	9,150[c]
Alameda Creek at Union City	653	1958-	USGS	2/ 1/63	19.25[h]	1,770[c]	1/21/67	10.37	90[c]
Coyote Creek near Madrone	196	*1902-	USGS	3/ 7/11	-	25,000	Regulated	No Peaks	
Upper Penitencia Creek at San Jose	21.5	1961-	USGS	3/28/63	3.53	295	1/21/67	6.24	1,500**
Alamitos Creek near New Almaden	31.9	1958-	USGS	4/ 2/58	9.67	4,300[c]	1/24/67	6.25	2,440[c]
Los Gatos Creek at Los Gatos	38.6	*1929-	USGS	2/27/40	14.71[b]	7,110	3/16/67	9.85	3,530[c]

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
<u>San Francisco Bay Area</u> (Continued)									
Guadalupe River at San Jose	146	1929-	USGS	4/ 2/58	16.55	9,150[c]	3/16/67	11.55	6,760[c]
Saratoga Creek at Saratoga	9.22	1933-	USGS	12/22/55	6.40	2,730	3/16/67	4.52	610[c]
Matadero Creek at Palo Alto	7.24	1952-	USGS	12/22/55	9.60[b]	854	1/24/67	4.65	760
San Francisquito Creek at Stanford University	37.5	*1930-	USGS	12/22/55	13.60	5,560	1/21/67	8.60	4,000[c]
Redwood Creek at Redwood City	1.82	1959-	USGS	1/31/63	9.36	644	1/21/67	7.56	450
Pescadero Creek near Pescadero	45.9	1951-	USGS	12/23/55	21.27	9,420	1/21/67	15.59	4,100
<u>Central Coastal Area</u>									
San Lorenzo River at Big Trees	111	1936-	USGS	12/23/55	22.55	30,400	1/21/67	14.26	10,300
Branciforte Creek at Santa Cruz	17.3	1940-43 1952-	USGS	12/22/55	22.04	8,100	1/24/67	14.64	3,500
Soquel Creek at Soquel	40.2	1951-	USGS	12/23/55	22.33	15,800	1/24/67	14.76	6,420
Llagas Creek near Morgan Hill	19.6	1951-	USGS	4/ 2/58	8.45	3,190[c]	3/16/67	6.39	1,700
Bodfish Creek near Gilroy	7.40	1959-	USGS	1/31/63	8.25	1,240	12/ 6/66	5.53	360
Tres Pinos Creek near Tres Pinos	206	1939-	USGS	4/ 4/41	7.75	8,060	12/ 6/66	4.99	437
San Benito River near Hollister	586	1949-	USGS	4/ 3/58	16.30	11,600	12/ 7/66	6.62	1,000[c]
Pajaro River at Chittenden	1,186	1939-	USGS	12/24/55	32.46	24,000[c]	1/30/67	16.31	6,110[c]
Corralitos Creek near Corralitos	10.6	1957-	USGS	4/ 2/58	7.55	1,970	1/30/67	5.03	610
Corralitos Creek at Freedom	27.8	1956-	USGS	12/22/55	15.6[h]	3,620	1/30/67	7.28	1,080
Salinas River near Pozo	74.1	1942-	USGS	1/21/43	13.35	7,210	12/ 6/66	14.23	14,200**
Salinas River above Philitas Creek near Santa Margarita	114	1942-	USGS	4/ 3/58	8.68	4,720[c]	12/ 6/66	12.45	11,000[c]**

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record Date	Stage in ft.	Dischg. in cfs	1966-67 Water Year Date	Stage in ft.	Dischg. in cfs
Central Coastal Area (Continued)									
Jack Creek near Templeton	25.3	1949-	USGS	1/25/56	9.56	5,040	12/ 6/66	9.58	5,100**
Estrella River near Estrella	924[r]	1954-	USGS	4/ 6/58	7.20	8,850	12/ 6/66	10.2	17,600**
Nacimiento River near Bryson	140	1955-	USGS	12/23/55	24.63	30,300	12/ 6/66	23.86	29,000
Salinas River near Bradley	2,536[r]	1948-	USGS	4/ 3/58	12.53	28,400[c]	12/ 7/66	16.24	34,200[c]**
Arroyo Seco near Soledad	244	1901-	USGS	4/ 3/58	16.40	28,300	12/ 6/66	16.30	28,000
Salinas River near Spreckels	4,157[r]	*1900-	USGS	2/12/38 1/16/52	25.0 26.85	75,000[c] -	12/ 9/66	22.70	19,800[c]
Big Sur River near Big Sur	46.5	1950-	USGS	4/ 2/58	11.56	5,680	12/ 6/66	10.30	4,510
Arroyo de la Cruz near San Simeon	41.4	1950-	USGS	12/23/55	12.40	17,700	12/ 6/66	15.27	34,100**
Santa Rosa Creek near Cambria	12.5	1957-	USGS	2/ 1/60 12/ ?/55	10.36 15.2[h]	2,520 -	12/ 6/66	10.00	2,200
Sisquoc River near Garey	472	1940-	USGS	1/23/43	8.46[b]	13,000	12/ 6/66	13.5	22,600**
Santa Maria River at Guadalupe	1,742	1940-	USGS	1/16/52	8.18[b]	32,800	12/ 6/66	8.20	16,000
Santa Ynez River below Gibraltar Dam, near Santa Barbara	216	1920-	USGS	3/ 2/38	-	35,500[c]	12/ 6/66	17.50	17,500
Santa Cruz Creek near Santa Ynez	73.9	1941-	USGS	2/ 9/62	9.75	4,520	12/ 6/66	10.30	5,750**
San Jose Creek near Goleta	5.51	1941-	USGS	4/ 4/41	-	1,960	1/24/67	9.08	1,620
Atascadero Creek near Goleta	18.8[r]	1941-	USGS	11/16/65	12.78	4,600	1/24/67	12.80	4,500
Carpinteria Creek near Carpinteria	13.1	1941-	USGS	1/15/52	9.75	2,440	12/ 6/66	8.60	2,720**
South Coastal Area									
Matilija Creek at Matilija Hot Springs	54.6	1927-	USGS	3/ 2/38	-	15,900	12/ 6/66	7.40	3,410
Ventura River near Meiners Oaks	76.4	1959-	USGS	12/29/65	*	7,910[c]	12/ 6/66	6.10	4,860
Coyote Creek near Oak View	13.2	1958-	USGS	11/24/65	9.10	4,410	12/ 6/66	9.08	5,010**

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
South Coastal Area (Continued)									
Ventura River near Ventura	188	1911-14 1929-	USGS	3/ 2/38	19.2	39,200	12/ 6/66	17.30	12,500
Santa Clara River at Los Angeles-Ventura County Line	644	1952-	USGS	12/29/65	11.50	34,100	1/24/67	9.21	6,530
Piru Creek above Lake Piru	372	1955-	USGS	2/10/62 3/ 2/38	12.20 -	12,200 35,000[b]	12/ 6/66	8.26	4,640
Sespe Creek near Fillmore	251	1911-13 1927	USGS	3/ 2/38	-	56,000	12/ 6/66	13.40	21,600
Santa Paula Creek near Santa Paula	40.0	1927-	USGS	3/ 2/38	10.56	13,500	12/ 6/66	6.43	4,500
Malibu Creek at Crater Camp near Calabasas	105	1931-	USGS	12/29/65	-	20,600	1/24/67	12.40	10,240
Ballona Creek near Culver City	89.5[r]	1928-	USGS	3/ 2/38	15.4	19,000	11/ 7/66	7.90	13,900
Los Angeles River at Sepulveda Dam	158	1929-	USGS	12/29/65	10.90	13,000[c]	1/22/67	7.90	8,150
Los Angeles River at Los Angeles	514	1929-	USGS	3/ 2/38	-	67,000[c]	11/ 7/66	10.10	32,060[c]
Rio Hondo near Downey	143	1928-	USGS	3/ 2/38	12.0	24,400[c]	1/24/67	9.47	20,090
Santa Ana River near Mentone	209[r]	1896-	USGS	3/ 2/38	14.3	52,300	12/ 6/66	13.25	15,300[e]
San Gabriel River near Azusa	214[r]	1895-	USGS	3/ 2/38	-	65,700[c]	Discontinued		
San Gabriel River below Santa Fe Dam near Baldwin Park	236[r]	1942-	USGS	11/23/67	17.14	11,100[c]	3/23/67	11.56	690
Santa Ana River at Waterman Ave. at San Bernardino	332[r]	1954-	USGS	3/ 2/38	-	75,700	12/ 6/66	6.85	12,000
Mill Creek near Yucaipa	38.1	1919-38 1947-	USGS	3/ 2/38	-	18,100	12/ 6/66	14.48	10,000
Lytle Creek near Fontana	46.3	1918-	USGS	3/ 2/38	-	25,200	12/ 6/66	9.76	7,200
Cajon Creek near Keenbrook	40.6	1919-	USGS	3/ 2/38	19.3	14,500	12/ 6/66	6.00	930
Santa Ana River at Colton	722	1961-	USGS	11/22/65	-	25,000	Discontinued		

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
South Coastal Area (Continued)									
Santa Ana River at Riverside Narrows near Arlington	851[r]	1927-	USGS	3/ 2/38	-	100,000	12/ 6/66	11.94	15,000
San Jacinto River near San Jacinto	141	1920-	USGS	2/16/27	-	45,000	12/ 6/66	9.80	5,720
Santiago Creek at Modjeska	12.5	1961-	USGS	11/22/65	6.60	1,500	12/ 6/66	7.47	1,430
Santiago Creek at Santa Ana	95.0	1928-	USGS	3/ 2/38	8.36	4,400[c]	12/ 5/66	5.90	5,700
San Juan Creek near San Juan Capistrano	106	1928-	USGS	3/ 2/38	-	13,000	12/ 6/66	5.38	9,000
San Mateo Creek near San Clemente	80.8	1952-	USGS	11/22/65	10.14	5,070	12/ 6/66	10.45	7,300**
San Mateo Creek at San Onofre	132	1946-	USGS	11/22/65	8.13	5,500	12/ 6/66	7.80	6,950**
Santa Margarita River near Temecula	588	1923-	USGS	2/16/27	14.6	25,000	12/ 6/66	7.78	3,000
Santa Margarita River at Ysidora	739	1923-	USGS	2/16/27	18.00[b]	33,600	12/ 7/66	12.83	6,720[n]
San Luis Rey River at Monserate Narrows, near Pala	373	1935-41 1946-	USGS	2/ 7/37 11/22/65	8.7[b] 4.80	- 2,850[c]	12/ 6/66	6.70	7,000**
San Luis Rey River near Bonsall	512	1916-18 1929-	USGS	3/ 2/38 2/1891	12.60[b] -	18,100[c] 128,100	12/ 7/66	10.84	6,080
Santa Ysabel Creek near Ramona	112	1912-23 1943-	USGS	1/27/16	14.0[b]	28,400	12/ 6/66	11.44	6,050
Santa Ysabel Creek near San Pasqual	128	*1905-	USGS	3/24/06	6.3[b,m]	8,000	12/ 6/66	11.56	6,130
San Dieguito River near San Pasqual	249	1956-	USGS	11/23/65	7.40	4,160[c]	Discontinued		
San Diego River near Santee	377	1912-	USGS	1/27/16	25.1[b]	70,200	12/ 6/66	9.30	3,450
Sweetwater River near Descanso	45.5	1905-27 1956-	USGS	2/16/27	13.2[b,h]	11,200	12/ 6/66	8.93	3,600
Central Valley Area									
Sacramento River at Delta	425[r]	1944-	USGS USBR	12/22/64	20.10	38,800	12/ 5/66	13.37	17,400
N. F. Pit River near Alturas	203[r]	1929-32 1957-	USGS	10/14/62	11.07	2,530	1/29/67	9.10	1,990

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Pit River near Bieber	2,475	*1904-	USGS	3/19/07	16.7	33,800	2/ 2/67	9.01	6,800
Pit River below Pit No. 4 Dam	4,647[r]	1922-	USGS	12/12/37	17.90	30,200	2/ 2/67	11.90	10,100
Squaw Creek above Shasta Lake	64.0[r]	1944-	USGS USBR	12/21/55	21.90	17,800	-	17.42	8,610
McCloud River above Shasta Lake	604[r]	1945-	USGS USBR	12/22/55	28.20	45,200	2/ 5/67	19.94	14,100
Sacramento River at Keswick	6,486[r]	1938-	USGS DWR	2/23/40	47.2[b]	186,000	12/ 9/66	27.53	53,700
Clear Creek at French Gulch	115	1950-	USGS	12/22/64	13.70	7,600	12/ 5/66	9.21	2,850
Clear Creek near Igo	228	1940-	USGS	12/21/55	13.75	24,500	12/ 5/66	6.14	2,800
Cow Creek near Millville	425	1949-	USGS	12/27/51	21.55	45,200	1/21/67	15.71	21,400
Cottonwood Creek near Cottonwood	922	1940-	USGS	12/22/64	19.64	56,500	1/31/67	14.70	22,800
Battle Creek below Coleman Fish Hatchery near Cottonwood	358	1961-	USGS	12/11/37	15.8[h,b]	35,000	1/21/67	11.23	8,020
Paynes Creek near Red Bluff	92.7	1949-	USGS	12/ 1/61	11.33	10,600	12/ 2/66	8.82	5,170
Red Bank Creek near Red Bluff	93.5	1959-	DWR USBR	1/ 5/65	10.21	12,200	1/30/67	8.63	4,472
Antelope Creek near Red Bluff	123	1940-	USGS USCE	2/22/56	12.43	11,500	12/ 2/66	11.48	5,990
Elder Creek near Paskenta	92.9[r]	1948-	USGS	2/24/58	13.90	11,700	12/ 4/66	7.91	3,850
Elder Creek at Gerber	136	1949-	USBR USGS	1/ 5/65	14.90	14,100	1/30/67	11.08	6,150
Mill Creek near Los Molinos	131	*1909-	USGS	12/11/37	23.4[h]	23,000	12/ 2/66	9.49	6,780
Thomes Creek at Paskenta	194	1920-	DWR USGS	12/22/64	15.32	37,800	1/29/67	9.56	8,480
Deer Creek near Vina	208	*1911-	USGS DWR	12/10/37	19.2[h]	23,800	1/29/67	8.80	5,620
Sacramento River at Vina Bridge	-	1945-	DWR USBR	12/23/64	90.92	162,000[c,e]	1/31/67	85.88	113,100
Sacramento River at Hamilton City	-	1945-	DWR USBR	12/11/37	150.7	350,000	2/ 1/67	44.61	103,500
Big Chico Creek near Chico	72.5	1930-	USGS	1/ 5/65	15.36	9,580	1/21/67	11.50	5,730

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Stony Creek near Fruto	599	1901-12 1960-	USGS	12/23/64	15.49	40,200[c]	1/30/67	11.83	14,100
Stony Creek near Hamilton City	777	1940-	USGS	2/25/58	18.31	39,900[c]	1/30/67	12.24	10,800
Sacramento River at Ord Ferry	-	*1921-	DWR	2/28/40	121.7	370,000	2/ 1/67	116.61	100,900
Sacramento River at Butte City	-	*1921-	DWR USGS	2/ 7/42	96.87	170,000	2/ 2/67	92.43	96,400
Moulton Weir Spill to Butte Basin	-	*1935-	DWR	2/20/58 2/26/58	83.66 83.66	36,000[d] 36,000[d]	2/ 5/67	80.80	14,140
Colusa Weir Spill to Butte Basin	-	*1935-	DWR	2/ 8/42	70.40	86,000[d]	2/ 1/67	67.10	51,560
Sacramento River at Colusa	-	1940-	DWR USGS	2/ 8/42	69.20	49,000[c]	2/ 1/67	65.83	39,500
Colusa Basin Drain at Highway 20	-	1924-	DWR	2/21/58	51.93	25,400[e]	2/ 1/67	51.21	4,600
Butte Creek near Chico	147	1930-	USGS	12/22/64	14.12	21,200	1/29/67	7.88	6,150
Butte Slough to Sutter Bypass at Mawson Bridge	-	*1934-	DWR	3/ 1/40	68.9	210,000	2/ 2/67	57.89	33,180
Sutter Bypass at Long Bridge	-	1914-	DWR	3/ 1/40	57.7	210,000	2/ 2/67	50.75	-
Tisdale Weir Spill to Sutter Bypass	-	1940-	DWR	3/ 1/40	53.35	25,700[d]	2/ 2/67	48.91	16,150
Sacramento River below Wilkins Slough	-	1938-	USGS	2/27/58	51.41	28,900[c]	2/ 1/67	49.00	26,200
Sacramento River at Knights Landing	-	1940-	DWR USGS	12/ 3/60 12/ 8/42	30.31 41.83[k]	30,000[c] -	2/ 1/67	39.04	27,600
Middle Fork Feather River near Clio	686	1925-	USGS	2/ 1/63	16.19	14,500	3/18/67	14.20	9,740
Middle Fork Feather River near Merrimac	1,062[r]	1951-	USGS	12/22/64	26.5[h]	86,200	1/29/67	14.14	15,000
South Fork Feather River at Enterprise	132	1911-	USGS	12/22/55	21.60	19,200	Discontinued		
North Fork Feather River near Prattville	493	*1905-	USGS	3/19/07	16.2[b]	10,000	Regulated	No Peak	
Butte Creek below Almanor-Butte Creek Tunnel, near Prattville	68.8	1936-	USGS	12/23/64	5.87	3,830	1/29/67	2.34	630
Indian Creek near Crescent Mills	739	*1906-	USGS	3/19/07	20.2[b,m]	25,000	1/30/67	10.32	6,710

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record Date	Previous Maximum of Record Stage in ft.	Previous Maximum of Record Dischg. in cfs	1966-67 Water Year Date	1966-67 Water Year Stage in ft.	1966-67 Water Year Dischg. in cfs
Central Valley Area (Continued)									
Spanish Creek above Blackhawk Creek, at Keddie	184	1933-	USGS	12/22/64	13.53	15,400	1/29/67	10.30	9,000
North Fork Feather River at Pulga	1,953	*1910-	USGS	12/22/64	35.80	73,000[c,g]	1/ 29/67	20.13	20,700[c]
West Branch Feather River near Paradise	113	1957-	USGS DWR	12/22/64	26.2	25,500	1/29/67	14.67	8,220
Feather River at Oroville	3,626[r]	1901-	USGS DWR	3/19/07	39.3[b,m]	230,000	1/22/67	14.56	53,200
Feather River near Gridley	-	*1929-	DWR q	12/23/55	102.25	-	1/30/67	88.70	45,600[c]
South Honcut Creek near Bangor	30.6[r]	1950-	USGS	12/26/64	19.25	17,000	1/21/67	10.95	6,040
Feather River at Yuba City	-	1944-	DWR	12/24/55	82.42	-	1/31/67	62.43	-
Middle Yuba River above Oregon Creek	162	1940-	USGS	1/31/63	18.55	31,600[c]	3/16/67	9.24	5,690[c]
Oregon Creek near North San Juan	34.4	1911-	USGS	12/22/64	12.88	10,300	1/29/67	8.50	2,590
North Yuba River below Goodyears Bar	250	*1930-	USGS	2/ 1/63	23.8[h]	40,000	1/29/67	10.88	7,180
North Yuba River below Bullards Bar Dam	487	1940-	USGS	12/22/64	40.45	91,600[c]	1/29/67	22.70	20,300
South Yuba River near Cisco	51.8	1942-	USGS	1/31/63	20.6[h]	18,400	3/16/67	7.49	2,140
South Yuba River at Jones Bar, near Grass Valley	310	1940-48 1959-	USGS	12/22/64	25.0	53,600[c]	1/21/67	13.64	9,810
Yuba River at Englebright Dam	1,109[r]	1941-	USGS PG&E	12/22/64	546.0[n]	171,700[c,f]	1/21/67	535.35	43,000
Deer Creek near Smartville	84.6	1935-	USGS	10/13/62	13.77	11,600[c]	1/21/67	11.53	7,810
Yuba River near Marysville	1,340	*1940-	USGS	12/23/64	90.15	180,000[c]	1/22/67	76.87	52,300
Bear River near Auburn	140	1940-	USGS	12/22/55	16.56[b]	19,700	1/21/67	16.60	10,200
Bear River near Wheatland	292	1928-	USGS	12/22/55	19.30[b]	33,000	1/22/67	12.21	16,500
Feather River at Nicolaus	5,923[r]	1943-	USGS DWR	12/23/55	51.60	357,000[c]	1/31/67 2/ 1/67	44.04	100,000

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Sourcea of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs.
Central Valley Area (Continued)									
Fremont Weir (West End) Spill to Yolo Bypass	-	*1935-	DWR	12/23/55	39.72	293,800[d]	2/ 1/67	37.22	-
Sacramento River at Verona	-	1929-	USGS DWR	3/ 1/40	41.20	79,200[c]	2/ 1/67	36.88	67,100
Sacramento Weir Spill to Yolo Bypass, near Sacramento	-	*1939-	USGS DWR	3/26/28 12/23/55	31.83 33.01	118,000[d] -	No Flow Over Weir		
North Fork American River at North Fork Dam	343	1941-	USGS	12/23/64	11.87	65,400[c]	3/16/67	6.21	17,100
Rubicon River near Foresthill	311	1958-	USGS	12/23/64	74[o,h]	-	3/17/67	11.27	5,380
Middle Fork American River near Foresthill	534	1958-	USGS	12/23/64	69[o,h]	-	3/16/67	12.70	17,100
Middle Fork American River near Auburn	613	1911-	USGS	12/23/64	60.4[h]	250,000[o]	3/16/67	17.60	16,100
South Fork American River near Camino	501	1922-	USGS PG&E	12/23/55	32.6[h]	49,800[c]	3/16/67	14.04	8,260
South Fork American River near Lotus	673	1951-	USGS	12/23/55	21.37	71,800[c]	1/21/67	11.54	14,200
American River at Fair Oaks	1,888[r]	1904-	USGS	11/21/50	31.85[b]	180,000	2/ 1/67	16.20	36,600
Sacramento River at Sacramento	23,530	*1879-	USGS DWR USWB	11/21/50	30.14[b]	104,000[c]	1/31/67	27.40	90,900
Sacramento River at Walnut Grove	-	1929-	DWR	11/21/50	13.0[b]	-	2/ 1/67	11.08	-
Adobe Creek near Kelseyville	6.39	1954-	USGS	12/22/64	9.11	1,500	1/21/67	7.93	990
Kelsey Creek near Kelseyville	37.2	1946-	USGS	12/21/55	12.80	8,800	1/21/67	12.62	7,240
Cache Creek near Lower Lake	528	1944-	USGS	2/24/58	9.40	8,000[c]	3/13/67	8.45	5,800[c]
North Fork Cache Creek near Lower Lake	198	1930-	USGS	12/11/37	13.98[h]	20,300	1/21/67	9.83	10,800
Cache Creek above Rumsey	-	1959-	DWR	1/ 5/65	21.4	59,000[c]	1/21/67	15.90	30,100
Cache Creek near Capay	1,042[r]	1942-	USGS	2/24/58	20.90	51,600[c]	1/21/67	15.92	28,800
Cache Creek at Yolo	1,138[r]	1903-	USGS	2/25/58	33.11[b]	41,400[c,g]	1/22/67	29.95	26,900
Yolo Bypass near Woodland	-	1939-	USGS DWR	2/ 8/42	32.00	272,000	2/ 1/67	28.48	123,000

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs.	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Dry Creek near Middletown	8.41	1959-	USGS	2/ 8/60	9.90	3,470	1/21/67	8.98	2,380
Putah Creek near near Winters	5.74[r]	1930-	USGS DWR	2/27/40	30.5	81,000	1/31/67	14.69	6,390
Yolo Bypass near Lisbon	-	1914-	DWR	12/25/64	24.68	350,000[e]	2/ 1/67	20.6	-
Sacramento River at Rio Vista	-	1906-	USCE DWR	12/25/55	10.2[b]	-	1/24/67	8.74	-
North Fork Cosumnes River near El Dorado	205	1911-41 1948	USGS	12/23/55	14.8	15,800[c]	3/16/67	8.34	3,520
Middle Fork Cosumnes River near Somerset	107	1957-	USGS	2/ 1/63	16.20	11,800	3/16/67	10.08	2,670
South Fork Cosumnes River near River Pines	64.3	1957-	USGS	2/ 1/63	10.90	5,540	1/22/67	6.67	2,540
Cosumnes River at Michigan Bar	536[r]	1907-	USGS DWR	12/23/55	14.59	42,000	1/22/67	9.95	15,900
Cosumnes River at McConnel	724	1941-	USGS USBR DWR	12/23/55	46.26	54,000	1/22/67	45.19	23,800
Cole Creek near Salt Springs Dam	20.4	1927-42 1943-	USGS	12/23/64	10.21	6,140	12/ 6/66	5.13	1,050
South Fork Mokelumne River near West Point	75.1[r]	1933-	USGS	12/23/55	14.8[b,h]	6,920	12/ 6/66	7.49	2,020
Mokelumne River near Mokelumne Hill	544[r]	(1901-	USGS	12/ 3/50	18.5	33,700[c]	6/18/67	8.79	7,010
Mokelumne River at Woodbridge	661[r]	1924-	USGS	11/22/50	29.58	27,000[c]	5/3/67	17.72	2,970
Mokelumne River near Thornton (Benson's Ferry)	2,045	1959-	DWR	12/24/55	18.00[b]	-	1/23/67	12.10	-
Bear Creek near Lockeford	47.6[r]	1930-	USGS	4/ 3/58	15.13	2,930	1/22/67	14.69	1,500
South Fork Calaveras River near San Andreas	118	1950-	USGS	12/23/55	10.29	17,600	1/22/67	9.02	8,960
Calaveras River at Jenny Lind	393[r]	1907-	USGS DWR	1/31/11	21.0[m]	50,000	Discontinued		
Cosgrove Creek at Valley Springs	21.1[r]	1929-	USGS	12/23/55	8.96	3,240	1/22/67	7.01	1,780
Calaveras River at Bellota	-	1958-	DWR	4/ 2/58	19.3	1,570[c]	1/22/67	10.01	-
Dry Creek near Galt	329	1926-33 1944-	USGS USBR DWR	4/ 3/58	15.28	24,000	1/22/67	14.27	10,500

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs.	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Mormon Slough at Bellota	-	1948-	DWR	4/ 2/58	20.65	15,400[c]	1/22/67	9.94	5,140
Calaveras River near Stockton	-	1958-	DWR	4/ 4/58	9.20	632[c]	1/22/67	10.27	680[c]**
Stockton Diverting Canal at Stockton	-	1944-	DWR	4/ 4/58[e]	17.18[e]	11,400[e]	1/22/67	16.18[e]	6,500[e]
Duck Creek near Stockton	-	1950-	DWR	12/24/55	5.75[e]	400	1/30/67	5.85	640**
South Fork Stanislaus River near Long Barn	66.9[r]	1937-	USGS	11/21/50	9.3	4,900[c]	3/16/67	4.94	850
Stanislaus River below Melones Powerhouse, near Sonora	905[r]	1931-	USGS	12/23/55	29.0[h]	62,800[c]	3/17/67	14.85	13,500[c]
Stanislaus River at Orange Blossom Bridge	-	1940-	DWR	11/21/50	30.05	52,000[c]	5/24/67	13.74	9,760
Stanislaus River at Ripon	1,075	1940-	USGS DWR	12/24/55	63.25	62,500[c]	5/25/67	56.19	7,890
South Fork Tuolumne River near Oakland Recreation Camp	87.0[r]	1923-	USGS	12/23/55	10.9[h]	11,900	12/ 6/66	8.08	3,770
Middle Tuolumne River at Oakland Recreation Camp	73.5[r]	1916-	USGS	12/23/55	11.05[h]	4,920	3/16/67	6.55	1,180
Tuolumne River at Modesto	1,884	*1878-	USGS DWR	12/ 9/50	69.19	57,000[c]	4/22/67	52.70	8,370
Orestimba Creek near Newman	134[r]	1932-	USGS DWR	4/ 2/58	6.57[b]	10,200	1/24/67	7.50	4,200
Merced River at Pohono Bridge, near Yosemite	321	1916-	USGS	12/23/55	21.52[h]	23,400	5/23/67	10.53	6,950
South Fork Merced River near El Portal	241[r]	1950-	USGS	12/23/55	18.70	46,500	12/ 6/66	12.71	11,100
Merced River near Briceburg	691	1965-	USGS	---	---	---	12/ 6/66	17.79	21,500
Merced River at Bagby	911[r]	1922-	USGS	12/23/55	26.80	92,500	Discontinued		
Merced River near Stevinson	1,273[r]	1940-	USGS USBR DWR	12/ 5/50	73.79	13,600[c]	7/ 4/67	69.41	6,510
Chowchilla River at Buchanan Dam Site, near Raymond	235[r]	1921-23 1930-	USGS DWR	12/23/55	16.50	30,000	12/ 6/66	10.52	6,880
Fresno River near Knowles	133[r]	1911-13 1915-	USGS	12/23/55	11.52	13,300	12/ 6/66	6.62	4,000

Table 16 (Continued)

Stream and Station	Drainage Area in Sq. M.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Fresno River near Daulton	258[r]	1941-	USGS USBR	12/23/55	12.64	17,500	12/ 6/66	8.11	4,900
Willow Creek at Mouth near Auberry	130	1952-	USGS	12/23/55	28.5[h]	15,700[c,r]	12/6/66	18.20	6,760
San Joaquin River below Kerchoff Powerhouse, near Prather	1,480	*1910-	USGS	12/23/55	51.0[h]	92,200[c]	12/6/66	31.60	28,800[c]
San Joaquin River below Friant	1,675	*1907-	USGS	12/11/37	23.80[b]	77,200[c]	4/21/67	9.62	8,230
San Joaquin River near Mendota	4,310	1939-	USBR	6/ 1/52	-	8,840[c]	4/29/67	12.72	4,460
Eastside Bypass near El Nido	-	1964-	DWR	1/ 2/66	11.55	1,560	4/26/67	16.14	11,250
San Joaquin River at Fremont Ford Bridge	7,619[r]	1937-	USGS USBR DWR	4/ 6/58	74.91	5,910[c]	4/27/67	66.73	5,380
San Joaquin River near Newman	9,524[r]	1912-	USGS DWR	3/ 7/38	65.81	33,000[c,g]	4/27/67	64.41	15,400
San Joaquin River near Vernalis	13,540[r]	*1922-	USGS	12/ 9/50	32.81	79,000[c]	4/30/67	29.28	26,100
Kings River below North Fork	1,342	1951-	USGS	12/23/55	23.08	85,200	12/ 6/66	19.85	63,000
Kaweah River at Three Rivers	418	1958-	USGS DWR	2/ 1/63	13.68	30,900	12/ 5/66	19.0	73,000**
Tule River near Springville	225	1957-	USGS	1/31/63	10.80	10,100	12/ 6/66	19.7	49,600**
Tule River below Success Dam	393	1953-	USGS	12/23/55	21.65[b]	27,000	12/ 7/66	-	8,260[c]
Kern River at Kernville	1,009[r]	1905-12 1953-	USGS	12/23/55	16.8[h]	29,400	12/ 6/66	22.2	74,000**
Northern Lahontan Area									
Willow Creek near Susanville	92.5	1950-	USGS	2/ 1/63	5.59	816	1/30/67	5.14	620
Susan River at Susanville	192	*1900-	USGS	12/22/64	7.30	5,100	1/29/67	5.51	1,450
Little Truckee River above Boca Reservoir near Boca	146	1903-10 1939-	USGS	2/ 1/63	9.00	13,300	5/21/67	3.77	2,740
Truckee River at Farad	932	1899-	USGS	11/21/50	14.5[h]	17,500	5/21/67	8.64	6,710
East Fork Carson River below Markleeville Creek near Markleeville	276[r]	1960-	USGS	1/31/63	8.21	15,100	5/24/67	4.77	4,400

Table 16, (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			1966-67 Water Year		
				Date	Stage in ft.	Dischg. in cfs.	Date	Stage in ft.	Dischg. in cfs
Northern Lahontan Area (Continued)									
West Fork Carson River at Woodfords	65.6	*1900-	USGS	2/ 1/63	9.00	4,890	5/24/67	4.80	1,600
West Walker River below Little Walker River near Coleville	180[r]	1938-	USGS	11/20/50	8.10	6,220	7/ 3/67	5.95	3,100
East Walker River near Bridgeport	359[r]	1921-	USGS	6/19/63	4.64	1,390	7/ 6/67	4.57	1,360
Southern Lahontan Area									
Mojave River at Lower Narrows near Victorville	530	1899-06	USGS	3/ 2/38	18.7	70,600[c]	12/ 6/66	10.00	17,900[c]
Mojave River at Barstow	-	1930-	USGS	3/ 3/38	8.60	64,300[c]	12/ 7/66	4.73	9,870
Mojave River at Afton	-	1929-32 1952	USGS	12/31/65	7.92	4,150	12/ 8/66	6.08	1,050

LEGEND

(a) USWB - United States Weather Bureau
USCE - United States Corps of Engineers
USGS - United States Geological Survey
USBR - United States Bureau of Reclamation
DWR - Department of Water Resources
PG&E - Pacific Gas and Electric Company
b - Site and/or datum then in use
c - Affected by storage and/or diversion
d - Discharge over weir
e - Estimated
f - Includes flow through powerhouse
g - Includes flow bypassing station
h - From flood marks
j - Crest stage gage
k - Discharge not determined; affected by backwater
m - Maximum observed
n - From DWR telemetering log
p - Due to failure of partially completed Dam
r - Revised
* - Incomplete record
** - Maximum of Record

△ 76906—950 5-68 1M